DOCUMENT RESUME

ED 031 928 08 EM 007 262

Annual Report: Information System for Vocational Decisions; 1 June 1967-31 May 1968.

Harvard Univ., Cambridge, Mass. Graduate School of Education.; New England Education Data Systems, Cambridge, Mass.; Newton Public Schools, West Newton, Mass.

Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.

Bureau No-BR-6-1819

Pub Date Sep 68

Grant-OEG-1-6-061819-2240

Note-174p.

EDRS Price MF-$0.75 HC-$8.80

Descriptors-*Career Choice, *Career Planning, College Choice, Computational Linguistics, Computer Assisted Instruction, Computer Oriented Programs, Data Collection, *Data Processing, *Decision Making, English, Guidance Centers, Guidance Facilities, Guidance Programs, Information Storage, Information Systems, Military Service, *Occupational Guidance, Psychology, Vocational Counseling

Identifiers-ELIZA, ERIC, ISVD, MONITOR

The Information System for Vocational Decisions (ISVD) helps a person make decisions in choosing a vocation by collecting and processing data which include the following areas of information: college, career, military service, family, and the user's responses. It is vital that the machine be made to understand English--the natural language of the user. Of the several computer programs that are designed to do this, ELIZA met the needs of this system. By "recognizing" key words and "decomposing" what the user says, it can analyze the sentence and thereby understand it. It is the user that makes the decision, not the machine. The machine relentlessly displays all the relevant facts (as far as is possible) so that the user is guided to consider them in his decision making, even if it means doubting a preconceived purpose. The user is provided with opportunities to analyze and harmonize disconnected sections in his vocational development. The ISVD data are somewhat like ERIC abstracts. There is a full report of the Harvard Project, and five appendices provide information relevant to the project. (MM/CO)

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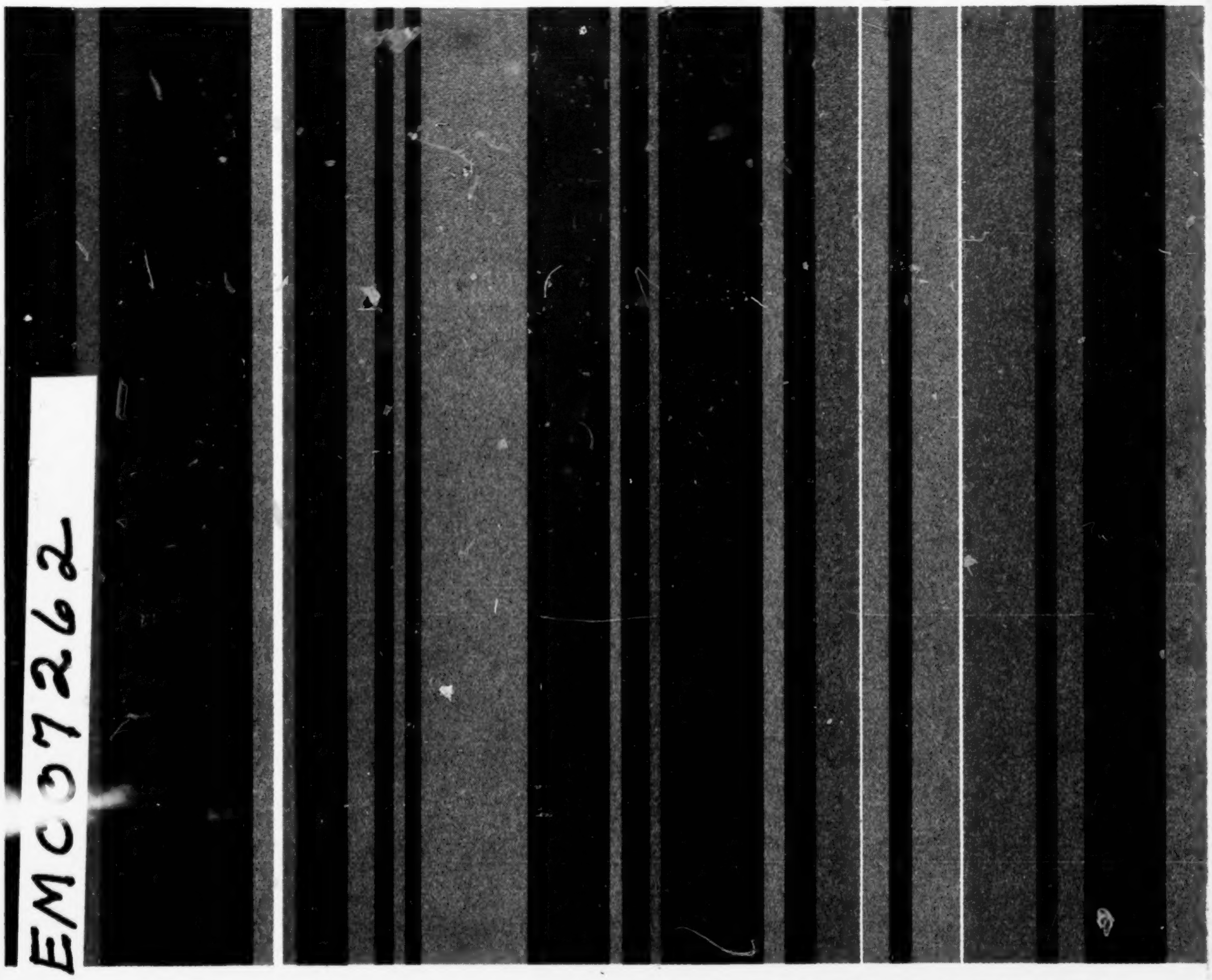
INFORMATION SYSTEM
FOR VOCATIONAL DECISIONS

Second Annual Report
1967-1968



EMC 007262

HARVARD GRADUATE SCHOOL OF EDUCATION
NEW ENGLAND EDUCATION DATA SYSTEMS
NEWTON (MASSACHUSETTS) PUBLIC SCHOOL SYSTEM

Annual Report

1 June 1967—31 May 1968

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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September 1968

Harvard Graduate School of Education
New England Education Data Systems
Newton (Massachusetts) Public School System

The work of the Information System for Vocational Decisions is supported by grant no. OEG 1-6-061819-2240 from the U.S. Office of Education, Department of Health, Education, and Welfare.

"Every man is the architect of his own future."

Appius Claudius Caecus, Aphorism, *from Speeches*
to Caesar's Senate, ca. 312 B.C.

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I. The Inception of the Information System for Vocational Decisions

INITIATION

The United States Office of Education and the President and Fellows, Harvard College, entered into agreement as of 1 June 1966 to support and construct the prototype of a computer-based Information System for Vocational Decisions (ISVD). The prototype is to be delivered on or before 1 July 1969, thirty-seven months from the date of initiation.

ORGANIZATION

The Information System for Vocational Decisions (ISVD) is directed by an Executive Committee. (See section on Authority for a list of its members.) Through this particular committee, the ISVD embraces the interests which Harvard University, the New England Education Data Systems (NEEDS), and the Newton School Department have in the construction and field testing of a computer-based, guidance and counseling inquiry system.

OBJECTIVE

The major objective of the ISVD is to improve vocational decision-making through the use of a computer-based guidance system. The program is to be so designed that the student can relate knowledge about himself to data about education, training, and work and thereby create a body of information on which he can base his career decision. The entire program links person, computer, and teacher or counselor in such a way that the student can conduct a dialogue with the computer, while the counselor assists in interpreting and evaluating the results of the dialogue.

PROBLEM AS STIPULATED IN PROJECT PROPOSAL

The following statement is quoted in full from the original proposal entitled An Information System for Vocational Decisions, *submitted by D. V. Tiedeman, E. Landy, W. J. Fletcher, A. B. Ellis, R. G. Davis, and E. G. Boyer, Principal Investigators, to the U.S. Commissioner of Education under the provisions of Section 4 (c) of the Vocational Education Act of 1963.*

"... participation in an occupation involves more than training in the specific skills required. Before, during, and even after vocational training the process of *decision-making* must also be involved. Central in decisions about occupations, jobs, or courses of study are facts/data[1] about one's self and about work. Facts illumine and frequently create decisions particularly when facts are given the status of data by inquirers. But decisions also create facts. This project therefore provides opportunity to study the interaction of facts and decision, and their subsequent creation of information.

"The proposed ISVD will deliberately play upon a potentially useful distinction between *data* (facts) and *information* (interpreted facts). The task of the information system is to enable the individual to transform data into information. This is to be done by teaching him to interpret the data in the light of his own knowledge, experience, and intention, so that his organization and use of the data represents his own personal relationship to them in the process of decision-making. We presume that only when data are used in this way can they be described as information where the individual is concerned. The information so generated can then, in turn, serve as data in the making of future decisions.

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[1] Occupational facts/data come in two conditions, fixed and modifiable. We therefore elect to adopt the cumbersome term, 'Facts/data,' to indicate this fact throughout the report. Occupational facts are directly recoverable without modification except for storage and later retrieval. On the other hand, occupational data consist of facts which must be additionally processed by the numeric and/or linguistic routines of a modifying system. Either unmodified facts or previously modified data need to be further mediated if they are to be turned into information. This is why we refer conjointly to facts/data whenever our connotation is associated with information.

"Given that the quality of decisions is directly related to the kind, quality, and comprehensiveness of the *information* (i.e., data in relation to personal intention) considered by the individual during the process of decision-making, then a fundamental task of guidance is to identify, evaluate, and classify needed information *and to make it readily available to counselors and students in useable forms and at needed times and places.* A second task is to learn how past decisions can be used to create information of value to the students who have made those decisions. We speak first of the provision and display of data, and its transformation into information. When we consider the teaching of decision-making, we will discuss the creation of further information by the analysis of past decisions.

"Guidance workers have had difficulty in providing and effectively displaying data. This is so because the amount of these data is directly related to the unparalleled rate of change in the technological world, which in turn is rapidly producing basic changes in our society. If we are to prepare students with skills, and attitudes and understandings for a changed and continuously changing future, we must know something of the nature of the changes involved. We must also encourage students to think of vocational planning as a *lifetime* process, not a one-time decision. 'The counselor must think *future* and not experience or he will be of diminishing value to the student of the sixties and seventies' (Wrenn, 1962, p. 20).

"Not only have counselors found it difficult to provide and display data, but the relatively infrequent contact between student and counselor has made the student's interpretation of data largely a hit-or-miss affair. Most students in secondary schools see a counselor three or four times a year at most. Furthermore, the nature of these contacts is frequently governed by a concern for the immediate next decision to be made ("What courses shall I take next term?") and the immediate interest of the student ("I'm interested in science.") The amount and quality of facts available to the counselor at the time of an interview is limited by his own knowledge and his school's resources. And the counselor's usual function is to provide facts for the student at the same time (and frequently without distinction) that he is attempting to get the student to use them.

"What is needed is a system which will provide for the student direct access to all relevant facts without requiring the *direct* mediation of a counselor. This would bring about a change in the counselor's role. Instead of being *both* source and interpreter of facts, he would have the primary responsibility of interpreting the student's *use* of the facts as he transforms them into information. This would require attention to the role of unconscious motivation, and the effort to help the student transform his tacit understandings into explicit ones. Also included in his role would be training the student in the use of the data system, supervising him in its use, and evaluating the student's decision-making process. Ultimately, it should be possible for the student to use the data system in a relatively independent manner for both exploration and decision-making, with recourse to the counselor only when assistance or interpretation is needed.

"Another important factor in the decision-making process is the student's '*sense of agency*,' that is, his awareness that he is an active agent in determining the course of his own career (Field 1964). We feel that many persons, especially those in economically depressed areas who have been socially and culturally deprived, may lack this 'sense of agency' because of a lack of accurate information about themselves and their real ability[2] to act on their environment.

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[2] Our colleague, Norman Sprinthall, at Harvard tells us that his recent research with Ralph Mosher and John Whiteley strongly suggests that even secondary school students lack conviction that they *have* any choice in and responsibility for their educational and vocational behavior.

"This proposal is in part an outgrowth of a study conducted during 1964-65 by John B. Carroll and Allan B. Ellis under contract with the U. S. Office of Education (Contract #OE-5-10-097) (Carroll and Ellis, 1965). The study was undertaken to determine the nature of a possible data bank and the role such a bank should play in the development of a systematic education program for the New England region. A significant conclusion reached by the investigators was that an educational data bank should not be a static storehouse. To be of real value to the process of education, a data bank must be dynamic enough to become a functional part of the education process.

"This conclusion was of special interest to the New England Education Data Systems (NEEDS), which was established in 1963 by the New England School Development Council and which is affiliated with the Harvard Graduate School of Education as well as with 57 other organizations.[3] NEEDS is an effort to bring the technology of data processing to bear on the administrative, curricular, and guidance problems of the schools of New England. A long-term objective of NEEDS is to establish a regional information center for its member school systems so that, as NEEDS grows, a large body of data will be available to facilitate educational research and development efforts in the region. This proposal is therefore designed to take a major step toward the development of such a comprehensive regional information center in the area of vocational education."

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[3] During 1967-68, NEEDS consisted of 67 member organizations.

II. Theory and Design

THE ROLE OF DECISION-MAKING IN INFORMATION GENERATION[1]

PRIMARY DATA FILES OF THE ISVD

The Information System for Vocational Decisions is to be a system in which facts/data[2] about educational, military, and vocational opportunities are turned by each of its inquirers into the information of a personally-determined career. The ISVD will contain three primary data files, one for each of these kinds of opportunities. These data files will be much like the files of abstracts created for the Educational Research Information Centers (ERIC) system which several universities are creating in the United States with initiative and support from the U.S. Office of Education.

Each of these three primary data files in the ISVD will be partitioned in several ways. One of these partitions will serve to distinguish between the stages of exploration or clarification in decision-making. The facts/data available for an educational, military, and occupational alternative will be fewer and at a more general level for the exploratory mode than for the clarificatory mode. When exploring, an inquirer will not be expected to maintain preference for an alternative. He will be expected to be forming his personal bases for preference among a set of alternatives. When clarifying, he them will be expected either to maintain his preference for an alternative or to return to exploration. In this phase of decision-making, the inquirer is expected to bring the perspective of doubt to a previously crystallized choice and to bear the anxiety of ignorance in the face of new facts about the chosen alternative.

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[1] The first part of this section is based on Project Report Number 12, "The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance," by David V. Tiedeman. Richard Durstine participated extensively in editing that document for this report.

[2] Facts/data come in two conditions, fixed and modifiable. We therefore elect to adopt the cumbersome term, "facts/data," to indicate this fact throughout the paper. Facts are directly recoverable with mediation except for storage and later recovery. On the other hand, data must be additionally processed by the numeric and/or linguistic routines of mediational system.

A second partition of each of the primary data files will be applied *within* its exploratory and clarificatory parts. This partition will be according to the discontinuity, or socially induced choice situation in life for which the data file is pertinent. With the education data file, this partition will specialize according to choice of: 1) high school curriculum; 2) post-secondary institutions; 3) post-secondary specialty; 4) graduate institutions; and 5) graduate specialty. In the case of the military data file, the partition will be directed toward promotion within the enlisted and officer ranks of each of the three major U.S. Armed Services. In the case of the occupation data file, it will include the choices: 1) occupation; 2) placement; 3) promotion; and 4) career.

The occupation data file will have an adjunctive file incorporating forecasts by industry according to national and regional conditions. The primary purpose of facts/data on forecasting will be described shortly.

PURPOSE AND SELF DEVELOPMENT THROUGH THE ISVD

The ISVD will offer access to the three primary data files within the context of achieving purposeful activity during self development. Two pedagogical modes will be provided for this context. One mode will be teaching *about* concepts relevant to purpose in self development. The concepts included in this mode will be: 1) the psychology of becoming purposeful; 2) self and decision-making; 3) psychological attributes and educational, military, and occupational decisions; and 4) any needed instructions for use of the three primary data files.

The second pedagogical mode will be that of decision-making applied to the data both of another's life and of one's own life. The basic mode with the data of another's life will be that of a game. An inquirer will either cooperate or compete with others in playing rounds in a game context that requires time planning in relation to future possibilities and consequences. The context of time planning will be in terms of education, work, leisure, and family. Future possibilities and consequences will be retrieved in part from the forecasting data file mentioned earlier. The playing of rounds of the game will provide rudimentary simulation of career development. However, the ISVD will also let inquirers substitute their *own* data in the game structure and will then use this simulated career development structure *in personal decision-making,* that is in decision-making in which the person is himself the player and the object of the game. In personal decision-making, the basic pedagogic mode will be that of guidance in counseling. In this mode the internalization of the game structure into the personality is expected and facilitated so that the game structure can become a guiding mechanism in the future anticipatory activity of the inquirer.

SECONDARY DATA FILES AND ROUTINES IN THE ISVD

The substitution of one's self for the life circumstance of another will create need for two kinds of secondary files. One secondary file will be that of the individual's education and psychological characteristics. This file will be created and maintained both to permit counselors to call for cumulative records and to permit individual inquirers to generate alternative possibilities for themselves by using the predictive framework in relation to anonymous psychological characteristics, choices, and later accomplishments as based on histories of other inquirers which will be stored in this file. This technique will in the ISVD be augmented by a procedure due to Thomas Hutchinson, a doctoral candidate at the Harvard Graduate School of Education. The Hutchinson procedure will allow the inquirer to specify both the alternatives he is considering and the levels of reward which he seeks from each specified alternative. The procedure will then provide indication of whether the inquirer's psychological data are like those of others who before him choose the alternative and achieved the designated rewards.

The secondary file will store important elements of the person's decisional frameworks in working out his life plans. The file will consist of summary statements which the person generates at the conclusion of each career, arising from using the repetitively applied routines of the ISVD in relation to each discontinuity in which he addresses his future and learns from his past in the ISVD. The inquirer will of course *himself* be engaged in abstracting his life circumstance while creating these data for his life.

Inherent in the secondary file on the person's decisional framework will also be a procedure due to Terence J. O'Mahoney, a doctoral candidate at the University of Leeds. This procedure will be a paired comparison of vaguely *pictured* occupational activities presented to reveal the person's self concept in the context of occupational activity. Such paired comparison operations give an inquirer clearer linguistic understanding of himself in ideal and actual terms. The understanding will then be an *explicit* basis upon which the inquirer can deepen his knowledge of his union of personality and occupation. Use of the procedure will be available for the mode of exploration, not clarification. In short, the O'Mahoney procedure as expanded from its present context of just occupational pictures will permit decision in an educational, military, occupational, or family context to aid in discovering harmonies and disharmonies in personal psychologies and activities.

FROM FACTS/DATA TO INFORMATION

GENERATING ENGLISH IN THE GUIDING MECHANISM

As has been noted, the basic aim of the ISVD is to help an inquirer to create a language structure in harmony with his evolving vocational development. In the ISVD, the computer is to assist in the processes both of his vocational development and of its harmonization with personal career development.

The personal career development which the ISVD attempts to cultivate presumes the existence of discontinuities in the person's vocational development. A discontinuity has both external and internal referents. The external referents are those aspects of the societal structure which precipitate discontinuity of personality development by virtue of forcing choice in order not to have a prescribed set of experiences and requirements for all citizens. In the ISVD, these external referents are keyed to the educational, occupational, military, and personal and family living decisions which are available in the United States.

The internal referents of discontinuities are those aspects of ego processes which give rise to and/or support the emergence of self awareness in career development. The internal referents emphasize the continuities of personality during the meeting of a discontinuity of society. As such they tend to stress the integrative aspects of personality in career development in relation to the differentiating aspects of society in vocational development. These internal referents are thus the potentially harmonizing conditions in the linguistic differentiation of vocational development which the ISVD seeks to cultivate during career development.

The ISVD assumes that a process is discernible and explicable during any meeting of the externals and internals associated with a societally-generated discontinuity in life. The ISVD further assumes that this process is analyzable by us and eventually by the person experiencing the discontinuity into anticipatory and accommodating phases. The Tiedeman and O'Hara theory of decision-making[3] on which this assumption is predicated further assumes that the phase of accommodation is both publicly and personally analyzable in terms of the steps of exploration, crystallization, choice and clarification and that the phase of accommodation is also publicly and personally analyzable in terms of the steps of induction, reformation, and integration.

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[3] David V. Tiedeman and Robert P. O'Hara. *Career Development: Choice and Adjustment.* New York: College Entrance Examination Board, 1963.

The ISVD is planned to bring a subject's attention upon the processes of vocational development for reasons of his achieving further harmony in career development. This attention will be sought both in a machine and in a personal context. In the machine context, the person interacting with the System will be treated as if he is an inquirer, a person who is himself in search of answers for problems which he is generating and who is also willing and able to assume responsibility for the actions predicated upon such inquiries. For this reason, the machine context of the ISVD will consist on the one hand of the primary data files which have been outlined briefly in the prior section.

The inquirer's searches of primary data files will also have to be mediated by the computer in some of its aspects. This mediation is being designed in the ISVD as if we were teaching a guidance machine to understand English. This stance is necessary in the ISVD in order to keep the subject's interaction as that of inquiry. However, the stance is more importantly necessary because the "game" of the System is to facilitate the incorporation of the English which the guidance machine is able to understand into the English upon which an inquirer becomes ever more aware that he has predicated his vocational and career developments. Thus through teaching, practice, and interpersonal relations, the ISVD expects the incorporation of the English understanding of the System into linguistic structures of the person. MONITOR will be a central concept for this incorporation. MONITOR will be a System control for checking the inquirer's understanding of the linguistic framework of his vocational and career developments. MONITOR will also consist of the rules and processes which went into our creation of that control. Through this means, the ISVD expects that a person will permit himself to be guided by our control and come to life by the internal operation of his intelligence as he grows in wisdom about his career development. 'MONITOR' is our way of expressing the stage of the generalization which is taken over by the person in his machine interaction. Supervision by counselors and instructors is our way of further generalizing 'MONITOR' in order to complete its internalization and operation in everyday practice by the individual.

The teaching of the guidance machine to understand English and the incorporation of that process because of interaction with an inquirer gives rise to the machine operations which have been previously referred to as those of the secondary data files. Secondary data files must be planned to operate in two ways. One of the ways that secondary data files must operate is subsidiary to primary data files when matters of accuracy in inquiry of those files are in focal attention. The other way in which the secondary data files must operate is superordinate to the primary data files when the teaching and practice of decision-making is in focal attention. It is in this superordinate operation of the primary data files that the hard design puzzles of teaching MONITOR and 'MONITOR' to understand English actually rest.

This sketch of the ISVD is neither easy to construct nor to understand. However, we trust that we have now created enough both of a review of the prior section and of an overview of terms and later discussion so that we are justified in proceeding with more of the detail of *how* ISVD will actually be structured so that some of its aims can be realized.

INFORMATION FROM FACTS/DATA

The details of the primary and secondary data files noted in the prior section are an inherent part only of the ISVD. However, the information processes which are also inherent in the concepts of the primary and subsidiary data files have more general applicability extending to all library data processed with the help of a computer. A particularly significant library project of this nature in the United States is that of the several ERIC projects. Each ERIC center has a specific subject. The researchers in each center are responsible for assembling and abstracting published literature in their subject and for servicing requests for references in that literature. The subject of guidance and counseling is handled at the University of Michigan under direction of Professor Gary Walz. We particularly refer to Walz' contributions to the theory of information generation as we proceed to consider that theory and the ISVD.

Walz and Rich have a significant article on ERIC and its potential contribution to the practice of student personnel services. In this article, Walz and Rich[4] first describe the processes of abstracting, indexing, and cross-referencing reduced information as we have somewhat described those processes in the preceding section. They then go on to consider both the predictable outcomes of those processes and their implications for student personnel services as well. These predictions and their implications constitute a potential possible in ERIC but not yet thoroughly implanted.

Predictable outcomes of the processes of data decomposition and article retrieval are, according to Walz and Rich: 1) synthesis and evaluation become dominant processes; 2) gaps in the information structure become evident; 3) use of impersonal resources increases; 4) opportunity for interprofessional interaction increases; 5) information, not a book, is retrieved; and 6) time to information is reduced and the band width of information is increased. The implications of data decomposition and article retrieval for pupil personnel services are: 1) the approach to learning will become that of inquiry; 2, 3, 4) the information generation process will require new skills to approach learning including stress upon the processes of evaluative integration and of information coagulation, not absorption; 5, 6) changed methods of professional communication and increased collaborative efforts will occur; and 7) small esoteric information systems will develop. Walz and Rich have thus enumerated important sets of outcomes and implications. However, their conclusion is:

> Perhaps one of the most important conclusions to be drawn from reviewing the outcomes and implications of information systems is that they may well *not be* a significant force for change. Wherever we have used "will", we just as well could have inserted "can". We are more assured that the mechanics of information systems are workable than

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[4] Gary R. Walz and Juliet V. Rich: "The Impact of Information Systems in Counselor Preparation and Practice," *Counselor Education and Supervision,* 1967, 6, 275-284.

> we are that individuals cn make the necessary changes in attitudes and beliefs to use them. The emergence of information systems is undeniably a force for change in counselor education. Whether it results in changes or not will depend upon the professional response to that force.[5]

Thus Walz and Rich stop somewhat short of asserting that data reduction and interactive retrieval actually will have the noted consequences. We in turn claim that the Information System for Vocational Decisions brings data reduction and interactive retrieval into a condition where the Walz and Rich consequences actually *will* be realized, not just *can* be realized. The ISVD is itself an interactive data reduction and retrieval system embedded within expectation, learning, and practice of personal decision-making. Decision-making is thereby given the role of information generator in the ISVD. Facts/data are turned into information by the inquirer within the context of decision-making *when* decision-making is subject to MONITOR, a concept we next specify.

ISVD AND MONITOR

As has been indicated, the basic scheme of ISVD is to have data files in which previously known facts/data are stored. The System will then guide personal interaction with the data files. Personal interaction is both to be taught and to be used in the System. Use of the System can first be as a game and then in the reality of one's own life.

MONITOR refers to the computer control functions associated with the reflexive activities required in the creation of self awareness during the decision-making practiced while choosing in using the primary data files. MONITOR will be fashioned to operate at three levels of awareness about this reflexive activity. At the rudimentary level, vocational development, vocational maturity, and agency development theories will be used within the paradigm of decision-making which has been outlined above. At this level, the System will itself be programmed just to assess the *quality* of decision-making as dictated by the concepts of the several theories. This will provide a first-order and mechanistic way of guarding against failures to exercise personal responsibility during the decision-making uses of the ISVD.

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[5] Ibid., p. 284.

The second level of operation of MONITOR will be that of giving the inquirer access to the rules and procedures of the first-level MONITOR. Each time the inquirer enters the System to interact in relation to a discontinuity in his future he will be encouraged to summarize his experience in relation to prior discontinuities which he has considered in the System. This process, which is named that of REVIEW, will include a routine which will create a juxtaposition of current statements about past experiences with past statements about what were then expectations about future events. This process of comparing the formerly anticipated with the presently actual is one of the important processes in the ISVD. The comparisons will be processed in the ISVD by the secondary data files having to do with the generalization of decision-making into career development within the context of vocational development. This processing will require all of the procedures of heuristic meaning creation which are inherent in the ERIC system, namely 1) the provision of an original product (in the ISVD this is the summary of past experience which the person first supplies), 2) the abstracting of that product (in the ISVD this is the turning of the summary into form permitting comparison), and 3) the creation both of primary and coordinate index terms and of a thesaurus of synonyms of them. In the second level of operation of MONITOR the inquirers in ISVD will first be instructed in our *System* use of this data reduction process which is inherent in the facilitation of heuristic meaning. The inquirer will also have to be given access to the actual procedures by which a primary and coordinate index and a thesaurus of synonyms operate in the ISVD computing system. He will then be permitted to use his own primary and coordinate index terms and thesaurus to process the summary data collected during REVIEW of his career development both at the moment and in past uses. This procedure will actually create the smaller esoteric information systems which Walz and Rich suggest within the conception of ERIC. However, within the ISVD these smaller esoteric information systems will be really personal and not accessible to another except upon authorization of an inquirer. In fact, the smaller esoteric information systems actually are the rudiments of the cognitive structure upon which the inquirer premises his personality in the realms of educational, military, vocational, and family decisions. ISVD will thus encourage the existence and applaud the formation of smaller esoteric information systems. These personal guidance systems constitute the compromises with totality which the individual must make while being accurate, detailed, and honest with himself in an ever-maintained effort to perfect his understanding of his actions and his experience.

ISVD AND MEANING THROUGH THOUGHT, COUNSELING AND SUPERVISION

Although the substitution of this second level personal "MONITOR" information system for the original System MONITOR represents a giant step toward understanding in individuality, it does not represent the completion of the process. Completion of the process further requires the machine-*free* use of "MONITOR" in the practiced use of thought in experience and action. This condition is never fully attained; it is only ever more closely approximated. It requires generalization of two phases of "MONITOR." One is that of the language of "MONITOR" itself. MONITOR will necessarily be linguistic. As Dudley and Tiedeman indicate,[6] language can never be fully co-extensive with experience. Therefore, the inquirer must be encouraged to see "MONITOR" as but a stage in understanding his harmonization of language and experience, not the end result itself. The end is more akin to his realization of language and experience as a paradox,[7] a predicament capable of being understood and appreciated but incapable of full formal construal in co-extensive fashion.

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[6] Tiedeman, David V.; and Dudley, Gordon A. *Thought, Choice, and Action: Processes of Exploration and Commitment in Career Development;* Cambridge, Mass.: ISVD, 220 Alewife Brook Parkway, 1967. (Multilith)

[7] Tiedeman, David V. "Predicament, Problem, and Psychology: The Case for Paradox in Life and Counseling Psychology," *Journal of Counseling Psychology*, 1967, 14, 1-8.

The second part of "MONITOR" which must be generalized in reaching for a practiced ease with thought, choice, and action is the inquirer's use of the condition in a social, not just a machine, context. In short, the person must move his personal "MONITOR" from machine context to interpersonal context. The counselor who supervises the inquirer's discovery of his personal "MONITOR" within the interactive computer processes of the ISVD must be the first agent of generalization of "MONITOR" from machine to interpersonal context. The counselor must use his own interaction with the inquirer as laboratory for that generalization and focus his skill in the assessment and cultivation of creative processes upon the attainment of that generalization *itself*. The supervisor of a person at school, Armed Service, or work in turn has opportunity to be the second-line agent of generalization of "MONITOR" from machine to interpersonal context. The supervisor who actually capitalizes this opportunity must also use his own interaction with the inquirer as laboratory for the generalization but must in turn focus his skill in assessment and cultivation of creative processes on the *substance* of the inquirer's role obligations in the *particular* situation under supervision. Finally, the inquirer is himself the ultimate agent for generalization of "MONITOR" from machine to interpersonal context. He must experience the weakness of the machine MONITOR within the context of his fantasy about control over circumstance and, with practice in machine and interpersonal contexts, gain confidence in his capacity to know some *but not all of* his anticipatory guiding system and its consequences in his life space.

We trust it is clear that the Information System for Vocational Decisions with its expected ramifications into non-machine and personal collaborative activity offers potential through MONITOR, "MONITOR", counseling, and supervision of turning the reduction, retrieval, and use of facts/data into an information generating function which in turn is used, understood, and appreciated.

In this sense we believe that what Walz and Rich suspect only *can* happen within ERIC *will* happen within ISVD.

Despite the strength of this assertion for the information generation potential of ISVD, let no one suffer the delusion that information generalization will actually occur *universally*. The ISVD will *expect* information generation to happen. The ISVD will consistently *attempt to make* information generation occur. The ISVD will be *diagnostic* about failures of information generation to appear. However, the ISVD will *only actually accomplish* information generation with those inquirers who both catch on to its theory and themselves come to use that theory without defense toward the System's part in its origin.

GETTING A GUIDANCE MACHINE TO UNDERSTAND ENGLISH[1]

THE CONCEPT OF THE GUIDANCE MACHINE

The first part of this section on Theory and Design gives decision-making the role of information generator in the ISVD. The Part also indicates that the capacity of decision-making in information generation will depend in the ISVD on the development of a guidance machine which can understand English. The guidance machine which understands English is in turn to become first the model and then the functioning capacity of an inquirer operating in his vocational development so that his linguisitic capacity to understand himself and his career is continuously expanded.

Part A of the section introduces the necessity for primary and secondary data files as these files are needed in the guidance machine which will understand English. In this Part of the section on Theory and Design we therefore continue the presentation of the System which is ISVD but do so by moving from a person who is linguistically developed in his understanding of his career development to the guidance machine which had to understand English because it helped him in his linguistic development as he engaged in his vocational and career developments.

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[1] This section is based on Project Report Number 14, "Getting a Guidance Machine to Understand English," by Allan B. Ellis, Margaret E. Pincus, and Patricia Yee.

The central purpose of the ISVD is to create an environment for deciding. The needed environment must be a reckoning environment because we want inquirers to do more than just make up their minds. We want them to figure up, measure, estimate, compare, judge, make calculated guesses, and in the end take responsibility for their decisions based in such reckonings of ours and theirs. This, of course, is what *deciding* means, but often people equate decision-making with choice-making and thereby miss the inherent notion of the process and its extension over time. What is left, usually, is the mistaken idea that a person decides by making up his mind, and thus we hear about the *moment* of decision as though it all happens at a point in time which is discrete and unbounded by thought and reflection. To make it clear that it is precisely this misconception and the resulting inflexibility we wish to challenge in ISVD, we have come to refer to the setting for vocational decision-making which we are creating as a vocational reckoning environment. However, we in turn will continually project in the ISVD the understanding that the reckoning a person ultimately needs is *his*, not ours or our machine's.

Along with the student himself there are two additional components within the ISVD reckoning environment. The first of these is an extensive collection of data about work, education, and family living. Facts about jobs, colleges, trade schools, military specialties, and about the student himself are just a few of the types of data to be stored and made available to him. These data are organized into five major data files: occupational, military, educational, personal and family living, and student characteristics. Naturally, while each of these files is separate from the other, they all reference each other so that a student may follow a question through all its aspects.

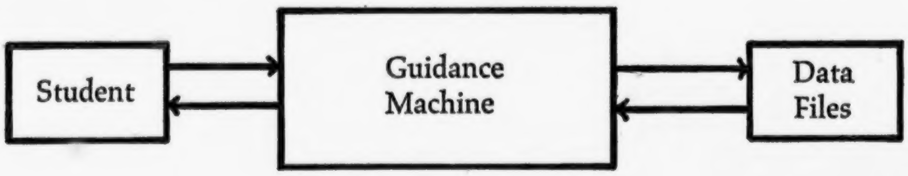
An important point which ISVD wants the student to realize about data is that in the real world they are never complete.

Often it is precisely this incompleteness of data about the world of work that makes decisions necessary in the first place. Thus, before one begins the process of decision-making he must understand the incompleteness of the data with which he is dealing.[2]

The result we hope for is that by developing these skills the student will cultivate in himself a *sense of agency*, that is, the belief that he is the significant agent in determining what happens to him.

Between the student and the data we intend to place a guidance machine. The function of this third and final element of the ISVD reckoning environment is to facilitate students' access to data and vice versa. That is, not only do we wish to provide a means for the student to gain convenient access to data, but we wish to keep track of such access as well. In this way, not only can an individual get facts with which to make decisions, but he can also gain a sense of the way he goes about making decisions.

One way, then, to describe the vocational reckoning environment of ISVD is shown in this diagram:



There is, of course, no such thing as a guidance machine, and the major task of ISVD, therefore, is to build one. Instead of building this machine in the usual way with pliers and screwdriver, however, ISVD is transforming an existing computer into a guidance machine by programming its software in appropriate ways and by inserting the materials called for by that software.

Software programming and new material construction are not unnatural tasks in a computing project, since computers are made for this sort of thing. What most people call a computer program

[2] Ellis, A. B. and Wetherell, C. S. "The Computer and Career Decisions." *Technical Memorandum: I*, Harvard-NEEDS-Newton Information System for Vocational Decisions, Cambridge, Sept., 1966.

is in fact an explicit statement of a procedure, and at the same time a description of the machine needed to perform that procedure. This is a behavioral description, but it is all that a computer needs in order to imitate the machine so described. It is the purpose of ISVD, therefore, to create a sufficiently explicit description of the behavior of a guidance machine so that a computer can behave as though it were that machine.

Our efforts to create a description of a guidance machine fall into two categories. The first is the development of certain necessary software. This consists of a fairly elaborate set of computer programs which permits certain basic and generally required functions to be performed. We need, for example, to operate in a time-shared setting so that more than one student can use the system at any one time. Furthermore, we must provide the ability to create, maintain, edit, and retrieve data files. A programming language to allow both string manipulation and list processing, programs for statistical analyses, routines to permit content analysis, and the general facility of keeping track of who is on the system and what needs to be done next are some other examples of the kind of necessary computer software with which we must be concerned.

The second category of a description of a guidance machine is the ISVD software itself. These are the programs that enable our time-shared computer to behave like a guidance machine, and it is here that any substantive contributions of ISVD rest.

The single, most significant component of the ISVD software is that network of routines we call *scripts*. Not unlike the manuscript of a play (from which it gets its name) a script is a set of rules describing how the guidance machine is to act. Scripts contain such things as the text to be presented to a student via either a video display device or a printer, commands to activate a tape recorder, or motion picture projector or to display a 35mm slide, instructions for how to process the student's responses, and rules for any computation or storage or retrieval of data.

When an inquirer interacts with a guidance machine under control of our scripts, the inquirer will in turn write a *scenario*.

A scenario will be the record of the inquirer's personal dialogue in the "play" which was our script. A scenario is illustrated in the last sub-section of this part.

We believe that a major feature of scripts must be the ability to allow what appears to be conversation between an individual and the guidance machine, because so much of the process of deciding consists of unstructured behavior (such as browsing through data files). Thus, the student must be free enough to generate his own questions and their scenario in as natural a form as possible. To this end we have spent some time in exploring the problem of getting a computer to seem to understand and to respond to English questions posed by the inquirer.

THE OPERATION OF A GUIDANCE MACHINE

There have been a number of efforts in recent years to get computers to deal with English sentences. Among these the works of Bobrow,[3] Green,[4] Helm,[5] Simmons,[6] and Stone[7] are especially relevant to ISVD. While we have been carefully examining the work of all these men to determine how we might benefit from them, this section is confined to but one such line of work. Specifically, we will describe our effort to adapt to our needs the computer program called ELIZA developed by Joseph Weizenbaum[8] of the Massachusetts Institute of Technology.

[3] Bobrow, D. G. "A Question Answerer for Algebra Word Problems." Memo 45, Artificial Intelligence Project, MIT, Cambridge, Mass., 1963.

[4] Green, B. F., Chomsky, C., Laughery, K. & Wolf, A. K. "Baseball: An Automatic Question-Answerer." In *Proceedings of the Western Joint Computer Conference*. Vol. 19, New York: WJCC, 1961. pp. 219-224. Reprinted in Feigenbaum & Feldman (1963), 207-216.

[5] Helm, C. E. "Simulation Models for Psychometric Theories." Princeton University, November, 1965.

[6] Simmons, R. F. "Synthex: Toward Computer Synthesis of Human Language Behavior." In H. Borko (Ed.), *Computer Applications in the Behavioral Sciences*. Englewood Cliffs: Prentice-Hall, 1962, pp. 360-393.

[7] Stone, P. J., Dunphy, D. C., Smith, M. S., and Ogilvie, D. M. *The General Inquirer: A Computer System for the Analysis of Text.* Cambridge: MIT Press, 1966.

[8] Weizenbaum, J. "Symmetric List Processor," *Communications of the ACM*, Vol. 6, No. 9, Sept., 1963, pp. 524-544.

While ELIZA is a computer program, it is convenient to think of it more as a scriptwriting language. This language permits an author to specify certain kinds of natural language conversations between man and machine. The ELIZA program accepts as input, scripts which describe the nature of the desired interaction. It is the job of the main program to process these scripts.

An ELIZA script is divided into two parts: a keyword section and a program section. The keyword section contains keywords and decomposition and reassembly rules. As Taylor[9] indicates, "The keywords provide some hint as to what the student is talking about while decomposition rules provide a way to analyze his sentence to determine what he is saying." The reassembly rules describe how the program is to fashion a response to the student's input, while the program part of the script contains further details of what is to be done when there is a match between a decomposition rule and an inputted sentence.

Specifying keywords is particularly important in ELIZA and entails not only constructing a relevant set of such words but also requires a concern for their position in an input sentence. Consider, for example, one possible response to the question

What would you like to do today?

I want to play the game of baseball with you.

This sentence matches the decomposition rule:

(0(*play take use see try) 0 game 0)

(Meaning: any number of words, including no words at all, followed by one of the words in parentheses, followed by any number of words, followed by the word *game*, followed by any number of words.)

Weizenbaum, J. "ELIZA-A Computer Program for the Study of Natural Language." *Communications of the ACM*, Vol. 9, No. 1, Jan., 1966, pp. 36-45. Weizenbaum, J. "Contextual Understanding by Computer." *Communications of the ACM*, Vol. 10, No. 8, August, 1967, pp. 474-480.

[9] Taylor, E. F. *The ELIZA Program: Conversational Tutorial, 1967*. IEEE International Convention Record, Vol. 6, part 10, pp. 8-15.

GAME is an important keyword in this script since it connotes an important part of the ISVD system. In the above example the machine has "recognized" the fact that the student would like to play a game, but it does not know which one since the word baseball was not picked up. The decomposition rule is very general and will probably match many different inputted sentences. Since this is the case, it must transfer control to a general statement which says:

Within the ISVD system there are only two kinds of games that you can play. One is called the life career game and one is a risk taking game. Which one do you want?

Rather tactfully, it reminds the student that in order "to play" the system he must stay within its context. Now consider the following:

I want to play the life career game

The above decomposition rule would match this input as well but the response would be inappropriate. So we must make a more specific rule:
(0(*play take use see try) 0 life career game 0)
and the transfer is directly to the game.

However, what if the student had said:

I certainly do not want to play the life career game

This sentence would match the above decomposition rule and transfer directly to the game, which, of course, would be an inappropriate response. So we must provide another decomposition rule that would provide for the negative:
(0 not (*play take use see try) 0 life career game 0)

Obviously then, the only way that we could be absolutely sure that the machine would understand what the inquirer is saying is to specify all the alternative decomposition rules with a particular keyword—probably an almost impossible task! How many ways can one use the word *game* in a sentence? How many and what words could possibly precede and follow it? The best we can do is to create our decomposition rules based on a confidence level of expected student response.

Although we will always as scientists do the best we can in specifying key-words, decomposition rules and reconstitution principles, we pause here to note the particularly important fact that *it is this very impossibility for completeness in the English understanding of the guidance machine which makes the guidance machine appropriate to the theory of the ISVD.* The theory of ISVD calls for the inquirer to interact with the System until he is satisfied that he can operate with its linguistic understanding but without need for later reference to it except for the help which he can always get from its data files and his esoteric information system. Because the guidance machine will invariably have imcompleteness in its key-words, decomposition rules, and reconstitution principles, inquirers will eventually find that the guidance machine cannot understand the English which they elect to use. The appearance of these times constitute teachable moments in the ISVD. The inquirer can either then go away mad and forever damn the machine because it cannot do what he expected it to do *for him* or he can then go back into the sequence he was pursuing and find out where the sequence began to fail with our key-words, decomposition rules and reconstitution principles. With MONITOR the inquirer will additionally be able to reprogram his own data file so that failures disturbing to him do not later occur. In that process, the inquirer will be learning that career is *in him* and that capability and confidence in working with career conceptions can be *his* if he but makes our language his.

Returning then to our story about the operation of a guidance machine itself, decomposition rules in an ELIZA script are listed in order of generality, the most specific listed first, and so on. The following is an example of the keyword section in our ORIENTATION script for the word 'game,' specifically the rules of play:

```
(game(game(—specification of keyword
(0 how 0 (*play take use see try) 0 risk 0 game 0) () aaa
```

```
(0 how 0 (*play take use see try) 0 life career game 0) () bb
(0 rules 0 life career game 0) () bb
(0 rules 0 risk game 0) () aaa
```

$$\underbrace{\text{(o rules o game)}}_{\text{DECOMPOSITION RULE}}\quad \underbrace{\text{(which game are you interested in.)}}_{\text{REASSEMBLY RULE}}\quad \underbrace{\text{o}}_{\text{TRANSFER POINT TO PROGRAM SECTION}}$$

Aside from keywords, decomposition and recomposition rules, ELIZA operates on several other powerful mechanisms. The first of these is called a DLIST. This function allows the scriptwriter to tag certain words as belonging to a particular category. Consider the following:

```
(MOTHER DLIST (/FAMILY) )
(FATHER DLIST (/FAMILY) )
(BROTHER DLIST (/FAMILY) )
(SISTER DLIST (/FAMILY) )
```

Mother, father, brother, and sister are all tagged family. This saves considerable time in decomposition rules. Instead of specifying a decomposition rule for each word, the scriptwriter can do the following:

```
(0 LOVE 0 (/FAMILY) 0)
```

which means: match an inputted sentence that has any number of words, followed by the word LOVE, followed by any number of words, followed by any word tagged FAMILY, followed by any number of words.

Now a reassembly rule would allow the computer to come back with an appropriate response:

```
(0 LOVE 0 (/FAMILY) 0) (WHY DO YOU LOVE YOUR 4.)
```

The 4 refers to the fourth element in the decomposition rule. In this case, the word tagged family. A conversation could go like this:

S: I love my mother.

C: Why do you love your mother.

S: Because she's nice to me.

C: Do any other reasons come to mind.

(This response is triggered by the word "because".)

Another important mechanism is the ability to make substitutions in the student's input and then apply decomposition rules to the revised input. For instance, some of the substitutions that we made were:

```
(OF COURSE = YES.)
(YEAH=YES.)
(NATURALLY = YES.)
(RIGHT = YES.)
```

What happens then is that any time 'of course', 'yeah', 'naturally', or 'right' occur in the input, the computer substitutes the word 'YES'. If we are looking for a YES response from the user and he types in any of the above, his input would then be treated as a YES.

A third mechanism is known as the table mechanism. This is powerful because it keeps track of the context of the conversation. It is used when there is a possibility of several different user responses, each of which refers to a previous context. For instance, a user might answer a question YES, NO, or UNSURE. In the keyword section of the script we have the following:

```
(0 YES 0 DLIST(YYY) )
(0 NO 0 DLIST(NNN) )
(0 (/UNSURE) 0 DLIST (ZZZ) )
```

Each decomposition rule is given a tag; the first is tagged (YYY), the second (NNN), and the third (ZZZ).

In the program section following the question, is the table. *A TYPE ('DO YOU LIKE TO PLAY GAMES.'), NEWTOP ('(YYY AA NNN AB ZZZ AC O'E M), TABLE).

The instructions to the computer go as follows:

TYPE the sentence 'DO YOU LIKE TO PLAY GAMES'. If he answers 'yes' go to the label (another piece of text usually) AA; if he answers 'no' go to the label AB; if he answers a word tagged 'unsure' go to the label AC; otherwise (O'E) go to the label M. STOP, wait for input (indicated by the period following the last parenthesis).

Another important feature of ELIZA is the ability of one script to call into play another script, to switch control and to return to the main script when that level of conversation has been terminated. We made heavy use of this ability.

For a more complete description of ELIZA, refer to the work of Taylor[10] and Hayward.[11]

ORIENTATION, ACCESS ROUTINES AND A SCENARIO IN ISVD: AN ILLUSTRATION OF AN INQUIRER INTERACTING WITH FILES THROUGH ORIENTATION AND ROUTINES PROGRAMMED IN ELIZA

ACCESS ROUTINES AND THE ORIENTATION SCRIPT IN ISVD

Stated simply, our first task in creating a guidance machine was to experiment with ELIZA in order to demonstrate its usefulness to the ISVD. We accomplished this task in the writing of demonstration scripts for the Access Routines of EXPLORATION and CLARIFICATION as well as for the ISVD ORIENTATION.

An access routine is a set of scripts that allow an inquirer access to various scripts, procedures, and to one or more of the System's several data files. In the ISVD, they are named EXPLORATION,

several data files. In the ISVD, they are named EXPLORATION,

CLARIFICATION, and REVIEW in an effort to use names close to the conditions in the Tiedeman-O'Hara paradigm of decision-making. The theory of access routine REVIEW was described in Part A above. EXPLORATION and CLARIFICATION are merely exemplified in this section as they operate as scripts which in turn give rise because of inquirer interaction to an inquirer's scenario.

Our scripts used in this experiment are inherently different from those developed elsewhere for the System in that they serve as calling (access) scripts or as data collection scripts. The purpose of a calling script is to ascertain what the inquirer wants to do: does he want to access the occupation data base, play the Life Career Game, developed by Sarane Boocock,[12] or think about which colleges to apply to? After the script has determined what it is that the inquirer wants, it calls in the appropriate materials.

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[10] Op. cit.

[11] Hayward, P. R. *ELIZA Scriptwriter's Manual.* Education Research Center, M.I.T.: Cambridge, Mass., March, 1968.

[12] Boocock, S. S. "The Life Career Game." *The Personnel and Guidance Journal,* Vol. 46, No. 4, pp. 328-334.

A data collection script, on the other hand, asks for specific information from the inquirer (e.g. what factors are important to you in thinking about college choice?), then analyzes the information and stores it for later use in the System.

In the demonstration ELIZA ISVD script system, the ORIENTATION script is used as the main calling script. The keywords in this script refer to our three presently operable primary data files (occupations, military, and education), and to the Life Career Game.

An inquirer as he goes through the ISVD ORIENTATION script may or may not know what he wants to do in the System. If the latter is the case, control is transferred to a script designed to help him choose an activity by checking his personal data file for suggestions.

In the following example the computer's output is in san serif type, and the inquirer's input is in serif type.

What would you like to do today?

I don't know.

Have you thought about what courses you are going to take next year?

Yes.

Would you like to explore that further now?

No.

Well, have you thought about what you would like to do after you graduate from high school?

Yes I want to go to college.

Would you like to talk about college choice?

O.K.

Fine. Since we know that you have not explored your college choice with the System before, the first thing we would like to find out is if you have thought about this choice enough to have some alternatives in mind. If you do, type the names of each of the alternative colleges. If not, type in the word no.

After an activity has been selected (in this case, college choice) control is transferred to one of the access routine's scripts.

If we think of the ISVD as a network of scripts, then the student is given a choice of three different kinds of scripts:

1) he can declare himself ignorant of vocationally relevant concepts and thereby gain access to concept teaching scripts;
2) if he realizes that future decisions affect his life (plan, style, etc.) and he wants to find out how, he can elect scripts for practice (such as the game);
3) if he wants to play the game for "real" , using his own data and applying 1 and 2, he can gain access to the decision-making access routines (EXPLORATION, CLARIFICATION, and REVIEW).

In the Tiedeman-O'Hara paradigm of decision-making, the purpose of exploration is to generate alternatives. Activity is to be planned so that alternatives are selected and so that preferences start to form. After an inquirer has explored any number of alternatives, crystallization should produce preferred alternatives and the bases on which those alternatives are favored. The purpose of the CLARIFICATION access routine is to test how strongly the individual maintains his commitment. Major activities in the routine are 1) those that determine if the bases for crystallization and choice do in fact exist and that the individual is aware of them, and 2) those activities that determine if these bases are realistically sound or too inhibitive.

The access routines must allow an inquirer to vacillate between EXPLORATION and CLARIFICATION when an alternative comes to mind, is only partially pursued, and is augmented by another alternative which in turn is only partially pursued. The repetition of these pursuits must be programmed so that they somehow give rise to a superordinate structure in which the inquirer can see crystallization and evoke the belief that he has chosen.

Since our intention was first to create a demonstration of ELIZA's capabilities we did not complete all the scripts that these access routines require. We feel satisfied, nonetheless, that the capabilities of ELIZA will allow us to come close to reflecting the Tiedeman-O'Hara paradigm of decision-making.

A SCENARIO IN ISVD USING THE ELIZA EXPERIMENTAL PROGRAMS

The following extended example of a student's interaction with the ISVD EXPLORATION and CLARIFICATION scripts will serve to indicate the ways in which ELIZA is being applied to our problem. We provide such a lengthy example to suggest not only the capabilities of our present demonstration system but also to provide a sense of the kind of flexibility we wish to offer the student. In the scenario which follows,[13] the computer's output is once again in san serif type; the inquirer's input in serif type.

What would you like to do today.

I want to think about colleges to apply to next year.

Since we know that you have not explored your college choice [illegible] the first thing we would like to find out is if you have thought about this choice enough to have some alternatives in mind. If you do, type the names of each of the alternative colleges. If not, type in the word no.

Harvard University, Boston College, and Berkeley.

Good.
What kinds of things did you do in exploring college choice. Did you read any college catalogues or talk with your guidance counselor. Make as complete a statement as possible.

I read the catalogue for Harvard and Boston College. I talked to my guidance counselor, and had a couple of interviews with the Dean at Harvard. My father went to Berkeley so that's why I'm interested in going there.

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[13] Because this demonstration was created roughly to explore technical, not substantive problems, the content or the wording of the scripts is subject to change as we proceed in implementing the intent of the grant.

These are the activities the machine has recognized or analyzed from your statement. You have discussed the matter with members of the family, spoken with a guidance counselor, read some college catalogues, spoken with college officials.
Here are some other things that may be a good idea to do if you haven't already. You could have discussed the matter with a teacher. Now then, look at the list of exploration actvities that you performed outside of the System. Here is the list of your present alternatives.
Harvard University, Boston College, and Berkeley. Now type in the activities that you feel helped you most in making up your mind or gave you some alternative colleges to think about. Please type them in in order of importance.

The interviews and talking with my Dad.

Good. Before we go on to explore college choice, what are the factors that you think are important in considering which colleges to apply to.

Grades, Class rank.

Anything else.

Tuition costs, test scores.

Here are some of the factors that other students found important (1) curriculum choice (2) course selection (high school subjects) (3) grades (4) class rank (5) test scores (PSAT SAT, CEEB, ACT) (6) extra-curricular activities (7) future vocational plans (8) goal in going to college (9) post college education and/or training.
Here is your list.
Grades, class rank, tuition costs, test scores. Look at both lists and then type in all factors from both lists that you consider important in thinking about college choice.

High school courses, grades, class rank, test scores, tuition costs, future vocational plans.

Fine. There are several ways that you can go about thinking about college choice within the ISVD system.

You can go through some concept scripts which are designed to give you some facts on topics relevant to college choice. Or you can play the life career game. Using the data of a make believe student who is like you in some ways you go through the process of selecting a college for him.

If you have specific colleges in mind, you can get data on them by accessing the education data file.

If you like, you can let the System guide you through a statement of preferences to come up with a list of colleges that most nearly matches your preferences. Or you can elect to first go through a unit on decision-making, a unit that tries to help you understand yourself and others in relation to making decisions. What would you like to do.

Access the education data file.

You have access the education data file. For demonstration purposes only, the following schools have been implemented. Harvard College (men), Goucher College (women), Berkeley University (large state supported school), Boston College (religiously affiliated), and Carnegie Institute (technical training school).

The following four variables have been implemented . . . costs (including tuition, room and board, and other fees), required entrance exams, criteria used in selecting students and required high school courses.

Now then you can query this micro data base in any way that you want. Please do not use question marks. If you wish to stop at any time, type in the word stop.

You may begin.

How much does it cost to go to Harvard.

Tuition at Harvard is 2000 per year including lab and health fees. Room and board is 1170 dollars. Non-resident student fee is 25 dollars. Books and supplies about 70 per year. Personal expenses about 375 dollars including room supplies, clothing, cleaning and laundry, recreation, and other personal expenses (except travel).

How does that compare with Boston College.

Boston College's tuition is 1600, room and board is 1050 dollars. Other costs include books and supplies about 100 dollars, lab fee 100 dollars and 30 dollars for women boarding students for health fees.

What high school courses should I take for Boston College.

No specific number of units is required however the following minimum is required . . . English (4), algebra (2), plane geometry (1), foreign language (2), trigonometry (for students planning to major in math, biology, chemistry or physics (2 for students planning to major in the above sciences and for applicants to the school of nursing), academic electives (5).

What specific entrance exams are required.

Boston College requires the SAT and three achievement tests. English, level I or II mathematics, and one of the candidate's choice.

Does Berkeley require the SAT.

Applicants who are ineligible, due to grade average, or to unit or distribution deficiencies, or who have graduated from an unaccredited secondary school, may qualify for admission by CEEB examinations. The three achievement tests required for those applying for admission are . . . English, one test in social studies or foreign language, one test in mathematics or a science. Requirements for California residents . . . total SAT score of at least 1000, and total score on three ACH of at least 1650 with no single ACH less than 500.0. Requirements for out-of-state residents . . . total SAT score of at least 1100 and total score on three ACH of at least 1725.0.

What are the costs there.

Tuition at Berkeley is 980 dollars per year of three quarters for out-of-state students. No tuition for California residents. Room and board varies between 600 and 940 dollars. Incidental fee of 242 dollars. Associated students membership fee 11 dollars. Books and supplies about 80 to 110 dollars.

How do they choose their students.

Berkeley selects its candidates on the basis of a candidate's secondary school record and CEEB scores. Alumni relationship and geographical distribution not relevant.

How about Harvard.

Harvard chooses its candidates on the following criteria. Secondary school record, school's recommendation, and CEEB scores. Also, character, personality and extracurricular participation are strongly emphasized. Special talents and interests also considered.

How much does it cost to go to Goucher.

There is a comprehensive fee of 2950 dollars per year including tuition, room and board, and lab fees. Student activity fee of 13 dollars, health fee 50 dollars, and gymnasium outfit 27 dollars. Other costs include books and supplies about 100 dollars.

What kinds of courses should I take.

16 units required, the following recommended . . . English (4), mathematics (3), (2 in Algebra, 1 in Geometry), one foreign language (3), History (2), Laboratory Science (1). The committee on admissions may allow entrance credit for work in elective subjects not listed.

How do they pick their students.

Goucher College bases its candidate selection on the secondary school record, the school's recommendation, and test scores. Other important factors are personal characteristics, extracurricular participation, and individual interests. Alumnae relationships and geographical distribution considered.

I think that I would like to stop now.

Would you like a summary of your exploration of the education data file.

Yes.

Fine.

You got data on the following variables for Harvard College . . . Costs, including tuition and room and board, how the school selects its students.
For Boston College you got data on the following variables . . . Costs, including tuition and room and board, what high school courses are recommended or required for entrance, what admissions tests you should take.
You have found out about what admissions tests you should take, costs, including tuition and room and board, how the school selects its students, for the University of California at Berkeley.
For Goucher College you explored the data on the following variables . . . Costs, including tuition and room and board, what high school courses are recommended or required for entrance, how the school selects its students.
You didn't explore the available data on Carnegie Institute.
Now then. Would you like to go back and find out anything more about these schools.

No.

Would you like to go into clarification now.

Yes.

Of the following colleges that you have explored, which would you consider applying to.
Harvard University, University of California at Berkeley, Boston College, Goucher College.

Boston College, maybe Berkeley, and Harvard.

Are they listed in order of preference, that is, is your first choice first etc.

No.

Please type them in order of preference.

Harvard University, Boston College, Berkeley.

You have decided to go into clarification concerning your preferred alternative Harvard University.
You have accessed the education data base and gotten some of the available data on Harvard University.
In exploration, you stated that you considered the following to be important factors in considering college choice . . . grades, class rank, test scores, courses, goal.
Now then, you should have a fairly good idea of where you stand in relation to these factors as well as where students admitted to Harvard University stand. Right.

No.

Would you like to go back to exploration to find out how you compare with Harvard students.

No.

Would you like to choose another activity.

Sure.

What would you like to do.

Find out about jobs.

How would you like to do this.

I would like to access the occupation data base.

O.K.
This occupation information script is an example of how specific information can be extracted from the civilian occupation data base. For this script, the following five jobs were selected—doctor, lawyer, barber, machinist, and musician. Seven categories of information are provided for each title—a description of job duties, salary, beneficial high school

courses, educational requirements, working hours, future demand, and percentage of men and women in field. If at any time you wish to stop, type the word stop. You may now begin.

Tell me about the work of a doctor.

Doctors are professionals who work in medical services, government, and colleges and universities. Their work is scientific and technical, and involves them with people. On the job they diagnose, and prescribe medication for diseases, treat injuries, and do surgery.

What is his salary.

A beginning doctor can expect to make at least $6500 per year, and may eventually make a maximum of $70,000 per year. Since many doctors are self-employed, he can sometimes set the number of hours he wishes to work and therefore vary his income.

How many men are there in this profession.

70 to 95% of all doctors are men.

What are his working hours.

Doctors often work nights and weekends. Doctors sometimes work outdoors.

Describe his education.

A doctor must complete professional or graduate school before entering his occupation. He needs 4 to 10 years of specific training for his job and then 6 months to 1 year of on-the-job training before being considered a full-fledged doctor.

How long do doctors live on the average.

Unfortunately there is nothing for that subject. Would you like to know the topics of information that are available for doctors.

Yes.

For a doctor there is information about what he does on his job, his education, advancement, applicable high school courses, salary, necessary abilities, physical demands of the job, future growth of the profession, percentage who are men, hours, licensing requirements, and working conditions. Would you like to see one of these topics.

Yes.

What is it.

What will be the need for doctors.

Current information indicates that in the future there will be an increasing demand for doctors.

What high school courses would it be helpful to take to become a doctor.

A high school student interested in becoming a doctor should consider taking the following courses—biology, Latin, chemistry, foreign languages, physics, and social studies.

For a lawyer.

A high school student interested in becoming a lawyer should consider taking the following courses—business, Latin, English, history, speech, and social studies.

What about his pay.

A beginning lawyer should expect to make at least $5500 per year. In addition he may receive health and life insurance and paid vacations. Since a lawyer may be self-employed, he can sometimes set the number of hours he wishes to work and therefore vary his income.

What about a barber.

A beginning barber should expect to make at least $65 per week, and may eventually make a maximum of $200 per week. In addition he may receive tips and health and life insurance and paid vacations. Since a barber may be self-employed, he can sometimes set the number of hours he wishes to work and therefore vary his income.

And a machinist.

He may receive free advanced training, overtime pay, and health and life insurance and paid vacations. Since a machinist may be self-employed, he can sometimes set the number of hours he wishes to work and therefore vary his income.

Describe his work.

Machinists are machine workers in the manufacturing of metal products, the manufacturing of electrical machinery, utility companies and the manufacturing of machinery. Their work requires them to deal with machines and techniques. On the job they set up and operate machine tools to make or repair metal parts or products.

Tell me about the musician.

Musicians are professionals who work in special schools, dance halls and schools and theaters, orchestras, and clubs. Their work is abstract and creative and requires them to deal with people and ideas rather than with things and objects. On the job they entertain the public by playing in symphony orchestras, dance bands, or jazz combos.

What kind of an education does he need.

A musician must complete junior high school and should also graduate from college before entering his occupation. He needs 4 to 10 years of specific training for his job before being considered a full-fledged musician.

Stop.

Would you like a summary of your exploration of the occupation data base.

No.

Do you want to go into clarification.

No.

What would you like to do.

I would like to access the military data file.

In the ISVD military data file you may see specific information for the Army, Navy, Air Force and general information for officers and enlisted men. You may use the military selection script and let the computer sort out jobs which may be of interest to you, or you may request descriptions for specific military jobs. What do you wish to do.

Take the job selection script.

The Navy, Army, and Air Force each have hundreds of specialized jobs. In order to simplify classification, these have been categorized by function according to career fields. The information presented here for each career field covers the various specialized positions included within it. Although not all of the general information given will apply for each specialty, you will receive an overview of the career field. To determine which career fields are best suited to you, it will help for you to answer the following questions. Armed forces jobs are performed in many locations. Indicate where you would prefer to work by selecting one or more of the choices from the following list.

1. On land
2. At sea
3. In the air
4. Indoors
5. Outdoors

(Note—For this demonstration, only the first question of the military job selection script is shown. After the inquirer has finished with this segment of activities, he will be queried as to whether he wishes to continue with the Military Data Base.)

Are you interested in seeing other things in the military data file.

Yes.

And what would you like to do next.

What is there to do.

You may look at job descriptions or request specific information for the Army, Navy, Air Force, officers and enlisted men.

Let me see information about the Army.

What do you wish to explore in the Army data file.

What about pay.

Here is the pay scale for enlisted men. Enlistees qualify for pay grades E-1 through E-9.

Minimum Time in Grade for Advancement	*Grade*	*Minimum Monthly Pay*	*Maximum Monthly Pay*
E-1 to E-2 4 months	E-1	$ 90.60	$129.00 a month after 2 yrs. total service
E-2 to E-3 6 months	E-2	100.50	141.00 a month after 2 yrs. total service
E-3 to E-4 6 months	E-3	121.80	193.80 a month after 4 yrs. total service
E-4 to E-5 1 year	E-4	168.60	252.60 a month after 6 yrs. total service
E-5 to E-6 2 years	E-5	200.40	328.80 a month after 14 yrs. total service
E-6 to E-7 3 years	E-6	232.20	387.60 a month after 18 yrs. total service
E-7 to E-8 3 years	E-7	269.40	528.60 a month after 30 yrs. total service
E-8 to E-9 2 years	E-8	428.40	587.10 a month after 26 yrs. total service
	E-9	510.60	657.30 a month after 26 yrs. total service

Here is the pay scale for commissioned officers.

Rank: Air Force and Army	*Navy*	*Monthly Pay: Normal Minimum*	*Monthly Pay: Normal Maximum*
Second Lieutenant	Ensign	$ 303.90	$ 336.30
First Lieutenant	Lieutenant Jr. Grade	420.30	504.60
Captain	Lieutenant	583.20	633.30
Major	Lt. Commander	700.50	807.30
Lt. Colonel	Commander	930.60	992.40
Colonel	Captain	1121.40	1216.50
Brigadier General	Rear Admiral (Lower Half)	1295.10	1384.80
Major General	Rear Admiral (Upper Half)	1530.60	1592.40
Lt. General	Vice Admiral	1648.20	1766.10
General	Admiral	1883.70	2002.60

Is there another subject in the Army Data File that you would like to see.

What topics are left.

There are 9 general categories of information in the army data file—pay and benefits, education and training, special units, women in the Army, promotion, enlistment requirements, the reserve program, and officer status for enlisted men. If you are interested in finding out what Army or military jobs may be suitable for you request the job selection script. What topic or subject would you like to investigate.

What about officers.

An Army man can achieve commissioned officer status by enrolling at a civilian college or university for a bachelor's degree or by appointment to the U.S. Military Academy or Officer Candidate School. Upon completion of any of these programs, he is commissioned as a Reserve Second Lieutenant. What else interests you.

I don't want to continue.

Are you interested in seeing other things in the Military Data File.

No.

Here are activities that may be of interest to you. You can learn about yourself by studying how you make decisions. You can play games which give you practice in planning educational and vocational activities. You may also work with the education and occupation data files. Do you wish to look at decision making scripts, play a game, or work with the education or occupation data files.

Play a game.

In the ISVD there are two kinds of games you can play. One gives you practice in taking risks. The other gives you practice in planning educational and vocational activities. Which kind of game would you like to play.

The second kind.

The life career game is designed to give you practice in forming your educational and vocational plans. Since you have never played the game with the System before, it might be wise to go through a general orientation. Do you want to do this.

Why not.

Think hard now. What was the first game you ever played.

Tag.

Do you remember how much you liked it.

Yeah.

Why did you enjoy playing tag.

It was a blast.

As children we like to play games such as tag, marbles, hopscotch, tac-tac-toe, and hide n go seek because they are fun. These games allow us to compete with other kids to try and win. But we can't say that they really teach us anything that is directly applicable to events in real life. Some games in addition to being fun, teach us something about real life activities. Have you ever played a game that seemed to be teaching you something about what goes on in real life.

Of course.

Well, games like Monopoly, Big Business, and Risk do teach us about things in real life (like buying and selling real estate, etc.). We call such games simulations.
The life career game is such a simulation. What you can learn from this game is the kind of planning that involves making decisions about things that are happening now at the same time you are thinking ahead to what you might want in the fuure. What kinds of decisions are you thinking about now that will have an effect on your future.

I do not wish to continue.

Are you interested in doing something else.

No, I would like to stop.

You have just exited from the System. Goodby.

DATA FILES FOR COMPUTERIZED VOCATIONAL GUIDANCE: REQUIREMENTS, PREPARATION, USE[1]

THE CONCEPT OF DATA FILES

The first part of this section on Theory and Design laid out the role which decision-making will be given as information generator in

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[1] This part is based on Project Report Number 15, "Datafiles for Computerized Vocational Guidance: Requirements, Preparation, and Use," by Richard M. Durstine.

ISVD. Through ISVD, inquirers will be helped to bring their vocational and career developments to an integrated condition of subvocalization. The ISVD will bring the linguistic structure of a person's career development ever further to the fore of his attention. The guidance machine which understands English is the prime mechanism for this goal. A guidance machine which can be taught to understand English has been described in the second part of this section.

The guidance machine which understands English will have the capacity through access routines either of responding to direct inquiry or of sending the inquirer to any one of the numerous data files which will be available through command of the programs of the guidance machine. The conception of data files is one which has had to be developed specifically for the guidance machine which lurks in the Information System for Vocational Decisions. This activity has demanded much of the time and resource of the project. Hence we describe the specific theory of data files at this time since that theory underlies many of the activities which are reported in the next section.

The project has since its beginning embodied the concept of large, orderly collections of factual information as an important part of its resources. This has led to the acquisition of several such collections of information (data files). It has also led to some general understandings about collection, storage, processing, and use of information for computerized guidance. These have now been developed and tested to the extent that a unified discussion of them is possible.

We present and explain in this part the approach to computer-managed information that has thus been arrived at, treating theory and related action, both past and planned.

Throughout we seek consistency with related theory and activities of the ISVD. Innocence of guidance and of computer technology may cause some errors in these areas, though we hope not to the extent of invalidating the major points of the theory of data files. These major points are:

1. Data should be collected and presented specifically to aid students in their vocational decisions.

2. Data should be treated in a form that exploits high speed computation. It hence needs to be systematic and highly structured.
3. The power and flexibility of operation thus gained is worth the price of rigidity of structure.
4. For the present, accuracy is of importance secondary to that of operational design.
5. Ready-made sources of information should be relied upon as far as possible. Direct collection of information is costly.
6. It is important (and possible) to articulate data from distinct and diverse sources into a working whole.
7. A primitive form of mediation between "facts/data" and "information" should be included with the data files.
8. Data files and means of access to them should be prepared separate from one another so they can be used in a variety of combinations.
9. The information given by the system should be suggestive, not prescriptive. It is the inquirer's responsibility to know and make use of this fact.

Some more specific criteria and general rules for their implementation will be found at the end of this part. The intervening discussion supports and elaborates on these general statements, drawing support mainly from the experience of preparing data files of occupational and military information for the ISVD.

THE FUNDAMENTAL TASK IN PREPARATION OF DATA FILES

The intended role of factual information in the ISVD implies two special requirements:

1. It should be collected, analyzed, and presented specifically to aid a student ("inquirer") in his vocational decisions.
2. It should be treated in a form that exploits the resources of high speed computation. It needs hence to be systematic and highly structured.

Each of these points is perhaps more significant than it looks.

Much factual information of possible value in personal decisions, particularly occupational decisions, is not generally found in useful form. It tends to be better suited for economists, planners, and employers. It needs special interpretation for profitable use by individuals. The psychology of occupations as it has developed is a step in this direction. Also needed is modification of highly detailed information to a form that serves the individual. This is the direction of the work described here.

Second, the need to deal with very large quantities of information concurrently, in many combinations and for many purposes, imposes strict requirements on treatment of that information. Also, a working vocational information system should accept with minimum disruption changes or additions to the information it treats or uses. Both these needs lead to involvement of the computer and demand a highly structured system. This degree of structure is the price of size and flexibility. We conjecture that the benefit is often worth that price. It is certainly a possibility worth exploring.

The structure thus imposed on factual information within the ISVD has led to the objection that the result may be "too mechanical." But this is functional and necessary to the approach we are taking. To cover it up would be troublesome and misleading. To eliminate it would for a long time to come be inefficient and costly. To be openly mechanical in this is a simple matter of honesty. A computerized information system that pretends to be fully human has no more self-evident merit than an airplane with flapping wings or a telephone with moveable lips at the earpiece.

A DATA FILE AND HOW IT GREW

The development of data files within the ISVD began with preparation and use of the project's first data file in the academic year 1966-67. A brief description of this file will motivate some of the conclusions that have been subsequently reached concerning data files in general.

The first data file will be referred to here as the "850 Titles File." It contains information under fifty-six categories about some 850 occupational titles. The categories are shown in Appendix I. This title-category structure is a useful—and obvious—one for data files in general. To render this concept explicit, an illustrative "mini-data file" is shown in Figure 1.

FIGURE 1
Illustrative Short Data File Based on Occupational Titles

Title	*D.O.T. Number*	*Coded Data*	*Descriptive Information*
Forest Engineer	005.187	45 O 5 1	Designs and Oversees Construction of Facilities for Logging
Egg Breaker	521.887	4 I 2 9	Separates Eggs for Use in Food Products

This tiny illustrative file gives a brief verbal description of the activities of workers in each of two occupations. In addition, in coded form, are given:

1. *Dictionary of Occupational Titles* (D.O.T.) number of the occupation;
2. Working conditions (first two columns under "Coded Data");
3. Education required (third column under "Coded Date");
4. Seasonality of work (fourth column under "Coded Data").

For example, the code "45" indicates that a forest engineer must use his hands, and be able to speak and hear to do his work. An egg breaker, on the other hand, also works with his hands, but need not speak or hear. This information is contained in the position and identity of the letters and numbers in the file. Hence great care is required in designing the data file to transmit precisely the intended meaning.

The illustrative data file also tells that a forest engineer works out of doors (an "O" in an assigned position of the file carries this information), while an egg breaker works indoors (indicated by an "I" in like position). Likewise a "5" and a "2," appropriately placed, indicate the levels of general education required for each (some college for the forest engineer, and some high school for the egg breaker). Finally, in the last column of code, a "1" indicates some seasonality in the engineer's work. "9" shows no information on this for the egg breaker.

This illustrative file exhibits all the characteristics and uses associated with any data file of this form. Though the 850 Titles File requires sixteen punched cards for the coded and other information about each title, it and the illustrative file are identical in their essential characteristics.

The mechanics of construction of a data file in this form are simple but strict. The way in which each piece of information is to be expressed must be unambiguously fixed. Words, numbers, or code may be used. In each case, exact meaning must be decided upon and stated. Words have the most flexibility, of course, and codes the least. However, codes are in turn most economical of space. Since the structure of the data file is highly rigid, changes or deletions can be made readily. Likewise, additions of titles or of categories are conceptually simple and mechanically straightforward. This flexibility of modification is one advantage bought with rigidity of form. This is of great value for any data file that can be expected to change in time.

Another point, perhaps less obvious and surely more controversial, is that accuracy of information is of secondary importance for the time being. It is not unimportant, but it is presently less important in the provision of a prototype than are structure and the means to use the file. For this reason, though a diligent attempt was made at accuracy in preparation of the 850 Titles File, no great effort is presently given to its modification and updating. (This is a mechanical task, of less immediate interest than learning to use the file in an imaginative and flexible way.)

Preparation of a large data file of factual information reveals the dependence of such files on large blocks of information prepared for other purposes. The work of agencies such as the Bureau of Employment Security and the Bureau of Labor Statistics is invaluable because many of their results can be taken readily and inexpensively into the file. This suggests three further criteria of data file preparation.

1. Direct preparation of information in large quantities is costly, so that ready-made information sources should be relied upon

as far as possible. Some information will eventually have to be gathered and prepared explicitly for the working ISVD, but this must be selected with great care in terms of its cost and and its usefulness.

2. Since ready-made information will seldom exactly suit the purposes it is to serve (unless they are the purposes for which it was explicitly prepared), it must be modified to a form as appropriate to the new use as possible.
3. The need to use as many information sources as possible makes necessary the ability to articulate diverse sources or collections of information into a working whole.

The above three requirements arise directly from the need to make maximum use of available resources. This need might be classed by some as regrettable. It is, however, so universal and unavoidable that it is merely one more fact in preparing information for use by the ISVD. The problem, then, is to handle information in a way that will best serve the uses of the system, given existing technological and economic limitations. In the following pages some steps toward a working solution will be presented.

Clearly the comments here are not limited to information about occupations, though they are derived therefrom and are hence particularly suited to that application. Any data that can be readily described in terms of titles and categories can be treated in this way. Thus these comments have considerable generality. The extent of their applicability must be judged in each individual case, of course.

Further issues of collection and storage of information will be discussed later. First, however, it will be helpful to review some theoretical characteristics of the ISVD as they relate to the preparation of data files.

ROLE OF DATA FILES IN THE ISVD

As indicated in the first part of this section "primary data files" have a central role in the operational definition of the ISVD working system. These primary data files are the data files referred to in the present part, of which the file of occupational titles described above is an example. The centrality of these data files within the ISVD thus requires their careful articulation with the system as a whole. The considerations that thus arise are of five kinds.

First, the data files (the "primary data files" of the first part) will function in the System together with some form of mediation (the secondary data files and MONITOR of the first part) to help convert the "facts/data" of the files to "information" by individual inquirers in the System. A major task of the System is to provide such mediation. Although the preparation of data files thus does not require the preparation of such mediating elements, the process of mediation will be helped if the data files are properly designed, and if some primitive form of mediation is provided with them. This both justifies and motivates the first steps that were taken toward use of the data files described above. These were:

1. Presentation of the contained information in English language form;
2. Provision for selection of information in terms of certain of its more important characteristics.

These two steps toward conversion of "facts/data" to "information" will be elaborated later.

Second, the process of decision-making by the individual inquirer is conceived in the design of the System as taking place at a number of discrete discontinuities. A central principle of the ISVD is that the inquirer should be helped to maximize his awareness of and participation in these discontinuities. The data files in use at any time will be identified in part by the discontinuity the inquirer is dealing with. As the System becomes adept at dealing with a variety of discontinuities, the structure and use of the data files to serve this end must be more and more highly refined. Thus the data files must remain flexible to varying demands depending on which discontinuity is being served. This is further reason why the highly structured form chosen for the occupational data file is appropriate to economical satisfaction of the demands of the System. It permits a single data file to serve a variety of discontinuities.

Third, the theory behind the ISVD prescribes that the inquirer be encouraged and taught to deal with his discontinuities in terms of a paradigm of several sequential stages. Again the data files will be called upon to perform differently depending on which of these stages the inquirer is in. Since at any moment each inqiurer is likely to be dealing with a different discontinuity and to be at a different stage of the paradigm, great flexibility is demanded of the data files. The structure of data files thus far provided is a step in meeting these needs.

Fourth, the capacity of the inquirer to absorb and use information should have some influence on which information is provided to him, and how. The same information might be presented in a number of ways, depending on the needs and capabilities of the inquirer. If the data file itself and the means of getting at it are separate (i.e., if more than one means of access and presentation can be adjoined to a single data file) flexibility in use of a single data file will be increased.

Fifth and finally, several means for mediation of "facts/data" to "information" will be used by the System. These include direct teaching of concepts, simulation, and real experience with decision-making. The data files should stand ready to serve these various pedagogical modes. This reinforces the requirements of flexibility, and of access to the files separate and distinct from the files themselves.

A YOUNG DATA FILE'S FIRST STEPS

It is clear, then, that the concept of the ISVD and of the operation of data files within it are both highly ambitious. Considerable time will be needed to bring them to fruition. It is hardly possible to conceive of there ever being a final system, but rather only of a working and evolving system. It is important to distinguish dreams from foreseeable accomplishments, and both from present achievements. The latter are important in that they help to confirm and give hope to the dreams. They also point the way to activities needed to bring foreseeable accomplishments to reality. It is thus desirable to consider applications of the 850

Titles File as it has developed, not as a final working thing, but as a first step, and as a suggestion of best directions for future development.

It will be recalled that the 850 Titles File consists of some 850 titles with information in fifty-six categories (prepared for computer use by placing the data for each title on sixteen punched cards; transferred subsequently to magnetic tape). It will also be recalled that this information is almost entirely in compact coded form of little direct use to an inquirer of the ISVD.

An obvious question in converting this data file to use by inquirers is how to present its contents in a form suitable for human comprehension. The answer chosen is fairly simple. As has been noted in the second part the mechanical problem of presentation of coded information is that of converting it to English or some other readable form. A second problem is that of choosing and interpreting information in a way that is maximally meaningful and minimally misleading. The mechanical problem is simpler, and will be discussed first and more fully.

The form adopted for presentation of information from the 850 Titles File can be readily described in terms of the mini-data file presented earlier. For each of two occupational titles, this file contains a brief description of the occupation plus certain coded information. For the moment it is not important whether this information is either appropriate or accurate. The mini-data file can answer questions such as "What does an egg breaker do"? "How much education does a forest engineer need"? "Where does an egg breaker work"? Answering such questions requires three steps:

1. Identify which category(ies) of stored information contains the answer to the stated question.
2. Find the appropriate information by title and category.
3. Present answer in terms understandable to the inquirer.

The first two of the above steps are technical ones, to be taken through accurate identification and location of the stored information. The last can be made by constructing a suitable sentence.

An example will suffice. To answer "Where does an egg breaker work"?, the System must first identify where information of this type is kept, if it is kept at all. In the illustrative mini-data file, this is the third column of code, in which an "I" or an "O" is found. From this it is possible to respond, "An egg breaker works indoors."

More generally, it can be said: "A (Title) works (x.)" This answers the question "Where does a (Title) work"? The System will place "indoors" in the sentence if the data file contains an "I" in the appropriate location, and with "outdoors" if there is and "O." If there are further possible situations such as "both," such a code must be defined, and words provided to interpret that code in the sentence. A special case is the possibility of a blank, or of an illegal answer, in which case some sort of null response would be called for.

The above procedure can be applied with considerable generality, given three things:

1. A skeleton sentence (e.g., "A (Title) works (x).") which makes sense for each possible insertion of (Title) and (x).
2. An English interpretation of the content of the data file for each possible content. This specifies "x" in the above sentence.
3. A substitute message if the coded information is unavailable or inappropriate.

Satisfaction of the above requirements calls for some precision and care, but is by no means impossible or even particularly difficult. Once the rules are set, new titles can be added—or information added, deleted, or changed in the file. Likewise, the form of presentation can be altered without changing the coded information. Thus to a great extent the content and use of the data file can be separated, with resultant valuable flexibility.

It is now a direct step to answering the request, "Tell me about the occupation egg breaker" or, "Tell me about the occupation forest engineer." In either case the answer would be built of the various sentences that answer individual questions about the named occupation. The result will of course seem somewhat mechanical, but with care in preparation it should not be unbearably so. Descriptions for the 850 Titles File have been prepared in this form.

The second question, that of choice and interpretation of information, must be resolved over a longer term, and is much more difficult to handle adequately and honestly. That approach taken so far has been to use whatever data are available, and to be forthright about what they do and do not say. The flexibility designed into the data file and into the presentation of its contents will then facilitate exploitation of improvements in quality of information as they become available.

The structure of the 850 Titles File, its contents, and the presentation of its information in the form described above, have been described in detail in working documents of the ISVD project. Further elaboration of these topics will not be given in this part. The question of access to the information in this file will similarly be treated in a brief manner.

Questions about any individual job readily come to mind, and can be listed more or less briefly, particularly given knowledge of the limited scope of information on each title. The choice of occupation(s) to ask about is far less obvious. To simply present a list of 850 titles and say "You may ask about any of these," would be folly. Such a list in its entirety is of little use. Some method of selective access is needed.

The most direct way of making this choice is in terms of selected characteristics of the titles in the data file. Again we resort to the mini-data file for illustration. The inquirer might ask "Which occupations involve indoor work and require less than a high school education"? The answer would be, "egg breaker." Let us examine this procedure and its limitations.

1. Response to the question can only be in terms of the occupational titles on the list, which is a limitation of the occupational titles approach. One way of relaxing this limitation will be dealt with presently.
2. Second is the matter of which questions the inquirer can ask

the data file. At the present stage of use of the 850 Titles File, questioning is in terms of responses to a set of multiple choice questions. In a fully free situation, he might make other requests, to which the data file could not respond. In that case a "don't know" or "unfortunately an answer on this subject is not available" message would have to be prepared.

3. A third eventuality is exhaustion of the file. With the mini-data file, there are, for example, no outdoor jobs that require less than a high school diploma. With a suitable message, this ceases to be a problem.

Search of the file by the computer for suitable titles is a straightforward matter, subject to the limitations mentioned above, and will see realization in the first working prototype of the ISVD.

It is important to remember that the attitude in presentation of data by the System is not prescriptive, but suggestive. The inquirer is not told that he must pursue life as an egg breaker, or even that this is desirable. He is merely informed of this alternative, and that it meets his apparent occupational specifications. A description of the occupation, prepared by the System as described above, tells him other facts about egg breakers (or forest engineers, or whatever), and gives him references to further information. He is then free to try out other sets of specifications, or to accept or reject further consideration of any title, either before or after he has received a description of it.

It is important for the inquirer to realize that the System tells what it is asked, and that it can tell no more than it knows. It is his responsibility to understand and make use of this fact. If handled properly, a system with incomplete information can be of use to the inquirer. This understanding is imperative, because full information will never be possible. A large and growing body of information will be a reality, however, and can be made responsive to the inquirer's needs, if he knows how to deal with it properly.

EXTENSION TO OTHER DATA FILES

Design for an evolving structure of data files within the ISVD can be based on experience with the 850 Titles File. First, however, a final dimension must be added to the problem namely the possibility of a complex data file composed of two or more files of the type already described.

This extension will be introduced by an example from the actual development of data files for the ISVD. The initial collection of information was made in terms of the 850 Titles File. Information from a variety of sources was coded into a highly structured framework as already described. At subsequent times other information also became available, including:

1. The supplementary volume of the *Dictionary of Occupational Titles* (D.O.T.);
2. Classification by Anne Roe's categories and levels of some 800 occupational titles;
3. Forecasts of demand to 1975 by occupation and industry of some 160 occupational groups and some 120 industrial groups.

The availability of this new information posed an important problem in information handling. In each new case the titles covered were substantially different from one another and from those in the originally prepared 850 Titles File. In the case of the supplement to the D.O.T., virtually all jobs of the earlier data file were included, so the additional information could be adjoined readily to the 850 Titles File. Waste arises from the fact that this leaves more than 90 per cent of the new information unused.

The information about Roe categories and levels (item 2 above) covers about the same number of titles as the original data file. The two lists are far from being equivalent, however. The bulk of the new information can be put to use by including it where appropriate, and leaving Roe category unspecified elsewhere.

In the case of the forecast information (item 3 above), the situation is considerably different. This information is given not by occupational title, but by occupational group. The titles used for groups of occupations and of industries exhaust all possibilities, referring sometimes to titles as "not elsewhere classified." Whereas there exist occupations that are not found in the D.O.T., there are in principal none that do not fall into one of this smaller set of occupational groups. The two classification systems are thus qualitatively different, and must clearly be treated separately.

Information by occupational title and information by occupational group can be articulated by treating one as an example of the other. Thus an example within the group "structural metal workers" is "pneumatic riveter," which is a specific title in the 850 Titles File. Likewise "pneumatic riveter" can be identified as a member of the group "structural metal workers," and through that identification other example titles can be found. Thus the disparity between the two lists is turned to good use. It adds flexibility to the search for titles of interest.

The above experience can be summarized in general terms as follows:

1. A data file might very well consist of two or more pieces (title-category blocks) that have distinctly different titles and categories of information included in them.
2. Translation between these can be facilitated by suggesting the titles of each block that correspond to each title of the other. These translations need not be unique in either direction.
3. Free use and flexibility of the data files can and should be encouraged by making these translations suggestive rather than prescriptive.

A second case of articulation of the sort described above has been carried out between the occupational data file and the military data file. The latter lists categories of assignments for enlisted men. This articulation promises to be helpful to the use of both these files.

SPECIFICATIONS FOR THE CONTINUING DEVELOPMENT OF DATA FILES

Data files for the ISVD and procedures for their use will undergo continuing development. There is no forseeable end to additions or alterations to this material and its uses. Any closed system of data files is to be shunned. A general plan for development is needed in which the data files are continuously operative, but in which new information can be accepted readily and with minimum disruption of operation. Such a plan is suggested by the experience of data file development described above. It derives explicitly from the data files on occupations and military service, but should apply readily to those on education, family living, and other topics an information system like the ISVD might eventually encompass. Needed are an ability to arrange the information in terms of titles and categories, as mentioned earlier; and to translate among the various sets of titles. The files thus can be readily articulated among themselves. They potentially, therefore, are not a set of data files, but one large complex file.

Experience so far with data file development suggests certain criteria and a set of rules to meet these criteria. These may seem self evident or trivial in retrospect. But they were by no means obvious during the development of the data files described here. They might also seem excessively general in form, but this is intentional, to allow application to a wide range of cases.

1. Data files should adapt to different use depending on which discontinuity and stage of decision-making they are serving for each individual inquirer.
2. Means of entry to each data file should be independent from the file itself, so that either the means of entry or the file itself can be changed without disturbing the other.
3. Likewise, form of presentation of information from a data file should be independent from the file itself for the same reasons.
4. Files should be designed so that additions and updating are possible without undue disruption of the existing files or of their operation.

These criteria, recognized as important in development of the existing data files on occupations and military service, must be interpreted individually for each data file. The following rules have been helpful in this regard.

1. Collect information by blocks in which information in well defined categories is given for a set of well defined titles
2. Entry to these blocks can be according to selected categories, or by title.
3. Coded information should be presented to the inquirer in English or some other readily understandable form. This in general will require structured formats within which to present the information.
4. Free access between separate blocks of information should be facilitated through explicit translation from the titles of one to the titles of the other. Properly done, this will provide flexibility and freedom in finding and taking information from the data files.

Much work remains in the preparation of data files. The job will probably never be over, since updating and additions can be expected to go on so long as there is a System. Three immediate needs, which set the stage for the near future, follow.

1. More accurate information, when and as this becomes available in readily usable form.
2. More appropriate information, aimed at individual decision-making rather than economic or large scale planning.
3. Less structured entry to the information. This is mainly a matter of information processing capability and is the task of the System as a whole, not just of the designers of data file.

III. Work Organization with Accomplishments and Plans

WORK ORGANIZATION DURING 1966-67

The previous section outlined the theory of the Information System for Vocational Decisions during 1966-67. The actual project activities were not yet fully consonant with the dictates of theory because accomplishments were not yet completely mature. For this reason we conducted the initial work of the ISVD during its first year of operation in accord with three broad areas, each of which consists of two related sub-areas.

The first broad area is concerned with *the development of a computer-based data system for vocational decision-making*. The first related sub-area consists of *the collection of data on education, training, and job characteristics and opportunities, and on the persons who will use the System.* (As has been indicated in the last part of the prior section, these data are initially only first approximations of the kind eventually to be developed.) This aim was achieved during the first year of work in the following Areas of the project:

Forecasting Area
Placement Area
Information Area
Inquirer Characteristic Area
Data Files Area
    (1) Occupational
    (2) Military
    (3) Educational

(4) Personal and Family Living
(5) Inquirer Characteristics

The second related sub-area calls for the *development of computer routines (computer programs) and utilization or adaptation of display devices (audio, video, tape, cartoon, film, etc.) which will connect the user, in terms of his personal characteristics, directly with the data so that he can generate information for his use in vocational decision-making*. This aim was pursued during the first year of the project through work in the Computer Area.

The second broad area of the project concerns itself with *the development of a training program, or course in vocational decision-making*. One part of this task called for the *specification and provision of the elements and process of decision-making for individuals of various ages and vocational situations*. This task was pursued during the project's first year through work in the following areas:

Decision-Making Area
Vocational Development Curriculum Area
General Curriculum Area
Psychological Curriculum Area.

A second, but related, task is that of *supervised practice in decision-making for inquirers and counselors, using the computer-based data and routines*. This activity was necessarily given secondary emphasis during the first year of the project. These aims were focused in the project through work in the following areas:

Educational Organization and Supervision Area
Reporting and Education Area

The third and final broad area of the project deals with the *study and assessment of the System, its users, and its use*. Since a computer-based system was not yet constructed, very little work was conducted in this Area during 1966-67.

WORK ORGANIZATION DURING 1967-68

The crystallization of the theory underlying the organization of Prototype I for the ISVD detailed in the second section of this Report, led to revision of the areas within which the activities of the project are best organized. Therefore, rather than organizing activities according to the categories listed in the First Annual Report, this Second Annual Report organizes activities according to the following four main areas and associated sub-areas.

The first main area is that of preparation of *primary* data for computer control of presentation. This includes assembly, organization and filing of *primary* data in each of the following areas:

Forecasting
Occupational and Placement Alternatives
Military Alternatives
Educational and Admission Alternatives
Family Living

An additional sub-area of activity is computer control of presentation of this material.

The second main area is concerned with decision-making and the generation of information through coordination of *secondary* data files, computer processing, and personal activities. Both instruction in decision-making and practice in decision-making by means of games are coordinated with *primary* data files.

Deciding and vocational development, and, deciding and agency development are coordinated through *secondary* data files. Also included in this second main area of activity is the computer control for processing of *secondary* data. An additional activity is that of counseling and supervision in the ISVD along with the required reorganization and re-education.

The third main division of activity is that of study and assessment of the System. Administration of the project comprises the fourth and final area of activity.

ACTIVITIES

Activities: Preparation of Primary *Data for Computer Control of Presentation*

Assembly, Organization and Filing of Primary Data

FORECASTING AND ASSOCIATED DATA FILE

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh, Elizabeth Truesdell, and Laurence Wolff

Summary

The overall plan for assembling and making occupational forecasts available consists of the following general phases:

June 1966—August 1967	1. Develop methodology and assemble data
September—November 1967	2. Apply methods to data and establish classifications for on-line use and updating
December 1967—February 1968	3. Establish operating system for Prototype I
March—June 1968	4. Implement 2 & 3 above for Prototype I
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	6. Implement Prototype II
January—May 1969	7. Field test Prototype II

Phase 1 has been completed. National forecasts of employment by occupation and industry are ready for use with Prototype I. The stage is thus set for local forecasts. A substantial bibliography for this and related forecasting work is now in preparation.

THE FORECASTING DATA FILE BASED ON NATIONAL DATA

The data file on forecasting is being developed as an adjunct to the data file on occupational alternatives, making use of the methodology developed in 1966-67. A classification system for occupational and industrial information has been designed that facilitates use of the most extensive available sources of forecasting information. Resulting estimates of employment, 1968 through 1980, are now ready for each of 165 occupational groups, covering the entire labor force. High and low estimates of employment by year have been prepared, based on data provided by the Bureau of Labor Statistics, for the six principal industrial groups corresponding to each occupational group. This information will be available in English language form to inquirers of the ISVD.

A DATA FILE BASED ON LOCAL DATA

The presently available estimates are based on national forecasts, but the data processing capability developed for them should also be useful in preparing local forecasts.

BIBLIOGRAPHY FOR FORECASTING

A structured bibliography is in preparation as base for future forecasting activities. Some 600 titles have been identified and classified according to key variables. These allow for addition of further titles as they become available, and for selective retrieval of references useful to forecasting.

OCCUPATIONAL AND PLACEMENT ALTERNATIVES AND ASSOCIATED DATA AND FILES

Occupational Alternatives and Associated Data File

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh and Patricia Yee

Summary

The overall plan for constructing the occupational data file consists of the following general phases:

June 1966—August 1967	1. Survey needs, available systems and data. Assemble data. Experiment with models for data retrieval of occupational data file.

September—November 1967	2. Construct and revise data file.
December 1967—February 1968	3. Plan and do cross-referencing.
March—June 1968	4. Implement 2 & 3 above for Prototype I.
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II.
September—December 1968	6. Implement Prototype II file.
January—May 1969	7. Field test Prototype II.

Phase 1 has been completed.

Successful development and use of data files on occupations depends on effective collection and presentation of information from diverse sources. Preparation and articulation of information to this end continues as called for in Phases 2, 3, and 4 as an important activity.

THE DATA FILE

Treatment of occupational alternatives centers around the file of some 850 titles described in the 1966-67 Annual Report and in the final part of the second section. This information has been augmented by specialized information from the *Dictionary of Occupational Titles* (D.O.T.) and by selected material from the *United States Census of 1960*. Of central importance is a capability to coordinate and present these varied pieces of information in an effective way. This has included: means for access to and presentation of the various parts of the occupational data file; collection of these parts into a working whole; articulation with information on related but external topics, such as military alternatives and printed references. Data and scripts to these ends are in advanced stages of preparation.

PLANNING FOR DIFFERENT CATEGORIES OF ACCESS

Special attention has also been paid to the following topics: 1) sorting of all titles of the D.O.T. in terms of scaled occupational traits in quest of useful groupings of occupations by worker function; 2) exploratory investigation of patterns of sequential passage from occupation to occupation; 3) preparation of material specifically related to occupational and career opportunities for women.

Library of Occupational Facts

Professional Personnel

Duncan Circle and Edward Landy, Directors; Wallace Fletcher, Dorothy Kunberger, James McDade, and Eugene Wilson

Summary

The overall plan for library assembly and use consists of the following general phases:

June 1966—August 1967	1. Assemble, classify, and make available occupational information in Career Resources Center
September 1967—May 1969	2. Update information as necessary
September 1967—February 1968	3. Use information in Prototype I both as scripts themselves and as reference material supporting script purposes
March—June 1968	4. Implement 3 above for Prototype I
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	6. Implement Prototype II
January—May 1969	7. Field test Prototype II

Phase 1 has been completed and Phase 2 is completely up-to-date. The library presently represents one of the most complete collections of occupational information available. This information is recorded on tape for easy retrieval of titles. This bibliography will shortly appear as a 213 page appendix to a document on the career information service. A script is being prepared to link the inquirer seeking information from the computer to a listing of relevant materials available in the Career Resource Center.

MATERIAL ACQUISITION AND UP-DATING

Funds were available again for the third year to add to the already extensive occupational information library at the Newton School Department. These funds were acquired under terms of Public Law 88-210 and were made available by the Bureau of Vocational Education of Massachusetts State Department of Education. This grant is for the purpose of writing a document on establishing a career information center and using occupational information with students. Major additions have been made in the area of audio-visual materials, principally sound strip films on educational and occupational information. This library represents one of the largest collections of occupational information available.

The audio-visual materials have been popular with the students. They are supplemental material which can be referenced to from Prototype I and II computer materials as programmed.

New books and leaflets have also been added as they were marketed. These additions allow us to have an almost complete collection of occupational information in its printed form. These will also be available as reference for Prototype I and II.

BIBLIOGRAPHIC RETRIEVAL

To make materials more accessible, their basic identification has been recorded on Hollerith cards and transferred to tape. This has involved a continued up-dating process. Through a variety of machine programs the material will be available for retrieval in different forms. During the Eighth Quarter, work on the entire bibliography has been completed and it will be printed as part of a larger book *The Career Information Service: A Guide to Its Development and Use.*

A script is written using the bibliographic information stored on tape to branch students from scripts on occupations to a listing of materials in the Center related to that occupation.

Placement and Career Resources Centers

Professional Personnel

Duncan Circle and Lawrence Lerer, Directors; Larry Dougherty, Allan Ellis, Edward Landy, and Dorothy Swithenbank

Summary

The overall plan for placement and career resource centers consists of the following general phases:

June 1966—May 1969	1. Establish placement and career resources centers in high school, college, graduate school, and employment institutions. Plan for computer activities in placement
September 1967—March 1968	2. Prepare placement activities for computer in relation to Prototype I
April—June 1968	3. Implement materials from 1 & 2 for Prototype I
July—August 1968	4. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	5. Implement Prototype II
January—May 1969	6. Field test Prototype II

One of the centers required in Phase 1 has been installed in a high school. This resulted in the continuation of the Jobs for

Youth activity with students looking for permanent work and for summer work. In preparation for Prototype I, the job placement script has been completed and nearly 500 present jobs and 1,500 employers and 2,000 listings of previous jobs have been coded.

A second center required in Phase 1 has been initiated in the Harvard Graduate School of Education. Activities in this area during this past year have involved two distinct but closely related tasks. The first or Phase 2 activities have focused on developing forms, procedures, and computer requirements for "batch processing" the many current routine activities of the Harvard Graduate School of Education Placement Office. The second task has focused on the development of a primary occupational placement data file relevant to graduate clients who will be involved in using the ISVD.

JOBS FOR YOUTH

Actual job placement is continuing for a second year. This includes, part-time, summer and permanent jobs. During the first year of the project 550 jobs were made available to students. During the second year this number has increased somewhat to more than 600 jobs. A close liaison has been established.

ESTABLISHING A PLACEMENT SYSTEM FOR A GRADUATE SCHOOL

Major efforts during this past year have been devoted to our first task: the development and elaboration of placement forms for "batch processing." Placement forms have been developed by working closely with the Associate Director of the Harvard Graduate School of Education Placement Office, directors of personnel from selected school systems, staff at the State Department of Education, placement offices at other universities and other interested members of the industrial and educational community. Sample forms were distributed to eighty-one potential employers and to date forty-five responses have been received. Forty-two of these have been most enthusiastic, two felt that the forms were inappropriate to their needs (Education Development Center and U. S. Office of Education); one respondent objected to the application of computer routines to placement activities.

Card formats and basic computer requirements have been outlined, and in the near future programs will be developed and trial runs initiated. It is planned that the system will be debugged and revised so that it can be available, on a limited scale, by September 1968 to coincide with the marked increase in Placement Office activities during the fall.

A PLACEMENT FILE FOR A GRADUATE SCHOOL

Work on the second task, development of primary occupational placement data file, was also begun. Preliminary information to be incorporated into such a file will be of two types: (1) general information about careers in "education," (2) specific data about placement activities of the Harvard Graduate School of Education Placement Office in relation to past clients. This data file will be made compatible with the "batch processing" activities noted above by indexing and categorizing filed data according to the following ten broad occupational categories established in the batch data forms:

Teaching
Administration
Guidance
State Departments of Education
Federal Government Agencies
Publishing
Other Educational Institutions
Research
Foundations and Other Non-Profit Educational Institutions
Curriculum Development

To date, the most complete data file is in the category of State Department of Education (Massachusetts). This file is now almost complete.

Scripts are being written for inclusion in Prototype II. One such script offers materials on the activities and procedures of the Harvard Graduate School of Education Placement Office itself; another will provide access to data files; a third will offer information about available data on careers. In this way links to both the occupational and placement data files will exist, and eventually to the data gathered in the "batch processing" placement activity. As presently conceived, an inquirer could go from the question, "What does an X do?" to, "Are there any current openings for an X?" and if there are, "Where are those openings?" to the questions, "How many X's has the Harvard Graduate School of Education Placement Office placed?" and, "Does my education and/or experience qualify me for being an X?"

As currently planned, the above activities will be completed by January 1969 to permit implementation simultaneously with other computer-based activities.

MILITARY ALTERNATIVES AND ASSOCIATED DATA FILE

Professional Personnel

Russell Davis and Richard Durstine, Directors; Lynne Fitzhugh and Patricia Yee

Summary

The overall plan for constructing the military data file consists of the following general phases:

June 1966—August 1967	1. Survey needs, available systems and data. Assemble data. Experiment with models for data retrieval
September—November 1967	2. Construct data file
December 1967—February 1968	3. Plan and do cross-referencing required among data files
March—June 1968	4. Implement 2 & 3 above for Prototype I
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II

September— December 1968	6. Implement Prototype II file
January—May 1969	7. Field test Prototype II

Phase 1 has been completed.

Content and rules for use of the military data file, for officers and enlisted men of the three principal services, are fully developed and are being readied for use by the operating ISVD. Completion of Phase 4 is expected as scheduled.

THE MILITARY DATA FILE

Basic information about officers' and enlisted careers in the Army, Navy, and Air Force has been coded. One hundred and seventy enlisted titles are included, as are a substantially smaller number for officers, where career lines are not so distinct. Concurrent with this coding of information was preparation of an English-language format for its presentation, and provision for entry to the information through the inquirer's responses to a programmed set of questions.

Preparation of the military data file provided an opportunity to apply some of the lessons learned from the earlier occupational data file, in particular that the files and their use are best prepared in a single operation.

The military data file was fully complete on paper at an early date, and has received priority treatment as a part of the operating computer system. It is presently being implemented into the System for Prototype I. As has been indicated in the second part of the second section, example EXPLORATION and CLARIFICATION access scripts, querying selected segments of the data file, were written in ELIZA for demonstration purposes. These scripts will be expanded during the coming months to enable the inquirer to access all facets of the data base.

EDUCATIONAL AND ADMISSIONS ALTERNATIVES AND ASSOCIATED DATA FILES

Professional Personnel

Robert O'Hara, Director; Robert Aylmer, Duncan Circle, Richard

Durstine, Carl Edwards, Allan Ellis, Marietta Haley, Thomas Hutchinson, Dorothy Kunberger, Lawrence Lerer, Priscilla Little, Jo Weissman, and Patricia Yee

Summary

The overall plan for constructing the education data file consists of the following general phases:

June 1966—August 1967	1. Survey of needs and available systems
September—November 1967	2. Plan for implementing of college file, trade school, high school and junior high school files
December 1967—February 1968	3. Plan and do cross-referencing required among data files
March—June 1968	4. Implement 2 & 3 above for Prototype I
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	6. Implement Prototype II files
January—May 1969	7. Field test Prototype II

Phase 1 has been completed. The specific college and non-college files have been planned as required in Phase 2. Phase 3 was essentially completed during the Seventh Quarter.

FAMILY LIVING AND ASSOCIATED DATA FILE

Professional Personnel

Charles Gunnoe and David Tiedeman, Directors; Myra Gannaway, John Page, and Esther Wiedman

Summary

The overall plan for constructing the family living data file consisted at the beginning of the Seventh Quarter of the following general phases:

June 1966—November 1967	1. Survey of ISVD needs and available procedures
December 1967—August 1968	2. Plan and construct data file
September—December 1968	3. Implement data file for Prototype I. Do restricted field testing of Prototype I to develop specification modifications for Prototype II. Implement Prototype II
January—May 1969	4. Field test Prototype II

During this year it became apparent that the construction of data files had to be divided between those intended for primary reference without being embedded in decision-making and those intended for secondary reference as that secondary reference is embedded in decision-making. This led to a revision of the plan for the family living data file.

Planning of the family living data file has therefore been split from the planning of the personal data file. The family living data file will remain as a primary data file; the personal data file as a secondary data file.

Only Phase 1 of this work has been completed. During the Ninth Quarter, the data file itself will be planned and assembled. On October 1, 1968 a decision will be made as to whether or not the completed skeletal approximation can be implemented in Prototype II. This evaluation will also determine the directions which further work in this area will take.

COMPUTER CONTROL FOR PRESENTATION OF PRIMARY DATA

Professional Personnel

Allan Ellis, Director; Thomas Hutchinson, Assistant Director; and Roy Norris, Jr., Director of Systems Design; Toby Boyd, David

Brewster, Barbara Howley, Margaret Pincus, Dana Quitslund, Charles Roehrig, Richard Roman, Arlene Scherer, Heather Scott, Stanley Schainker, Arnold Smith, Dorothy Swithenbank, Thomas Swithenbank, Ann Taylor, Charles Wetherell, and Patricia Yee

Visiting Researchers

Roy Forbes, General Learning Corporation; Selwyn Taylor and Gary Stapleford, Sanders Associates; John McManus and Fran Archambault, University of Connecticut; Keith Whitmore and William Mittlestadt, Eastman Kodak

Consultants

Thomas Cheatem, William Goldfarb and Robert Mitchell, Computer Associates

Summary

The overall plan of the computer area as devised in the summer of 1966 consisted of the following general phases:

June 1966—February 1967	1. Explore existing software and hardware
March—June 1967	2. Test and evaluate techniques uncovered in exploration
July—October 1967	3. Specify Prototype I (computer)
September 1967—February 1968	4. Implement Prototype I (computer)
March—June 1968	5. Test and refine Prototype I (computer)
July—October 1968	6. Specify Prototype II (computer)
July—October 1968	7. Implement Prototype II (computer)
November 1968—January 1969	8. Test and refine Prototype II (computer)
November 1968—January 1969	9. Specify Prototype III (computer).

The computer area revised its overall schedule during the Seventh Quarter. Late arrival of the computer, limited availability of system descriptions, and the need to examine RCA's Basic Time Sharing System more closely than originally anticipated are the three major reasons for this schedule change. While the schedule has been changed, however, the sequence of phases remains unaltered.

The principal change affects Phase 4 (Implementation of Prototype I) which was originally scheduled to end in February, and which has been extended to June 1968. The schedule for Phases 5 through 9 is affected by this change, although this fact will probably not create hardships for ISVD. The computer area's present plan, then, for Phases 4 through 9 is:

December 1967—June 1968	4. Implement Prototype I
June—September 1968	5. Test and refine Prototype I
September—October 1968	6. Specify Prototype II
October 1968—January 1969	7. Implement Prototype II
January—June 1969	8. Test and refine Prototype II
January—June 1969	9. Specify Prototype III

The computer area has spent the year performing certain tasks which make it possible for a general purpose computer to behave like a guidance machine. These tasks are absolutely necessary for the purpose of the project. Without a guidance machine, ISVD cannot contribute to career development. Although ISVD will not work without the turning of a general computer into a guidance machine, their completion does not constitute the creation of the guidance machine itself. The product of the year's work in this area is therefore merely a computer ready to accept statements from members of the guidance areas of ISVD on how it should behave within the ISVD decision-making environment. Computer area activities will be reported under two headings: hardware and software.

HARDWARE

On 15 December 1967, the computer area began daily use of the RCA Spectra 70/45 computer owned by the New England Education Data Systems (NEEDS). The machine has been used on the average of four hours a day to develop the required software for Prototype I. The equipment consists of the following components:

Quantity	*Model No.*	*Descriptions*
1	70/45-F	Spectra 70/45 Central Processor (131 K byte core)
		With following features:
1	5001-45	Memory Protect Feature
1	5002-45	Elapsed Time Clock Feature
1	5006-45	1401 Emulator Feature
1	5016	Three Selector Channels
1	70/97	Operator Console
1	70/234-10	Card Punch
1	70/237-21	Card Mark Reader with
	5204	Column Binary Feature
2	70/242-10	Printers, Medium Speed
2	70/442-2	Two (each) Magnetic Tape Units with
2	5412-2	7 Channel Feature
1	70/442-2	Two (each) Magnetic Tape Units 9-level
1	70/473-208	Dual Channel Tape Control with
	5402-1	Pack/Unpack Feature
2	70/551	Random Access Control with
2	5501-1	I/O Attachment Feature, and
	5515	Emulation Mode Feature

4	70/564	Disc (Pack) Storage Units
1	70/668-11	Communication Control Multi Channel with
14	70/770-21	Communication Buffers (asynchronous)

Our terminal equipment centers on a Sanders 720 Video Display device. Two components are attached to this device. First there is a KSR33 printer slaved to the 720 in such a way that the contents of the screen can be printed out whenever it is desired. The second unit connected to the 720 is a Kodak Instructional Carrel consisting of a tape recorder, two random access slide projectors, and two motion picture projectors (yet to be delivered). This unit will be controlled by the Sanders 720 as specified by the computer. This is made possible by a special interface between the Kodak carrel and the display terminal which was engineered by Sanders Associates. The details of these units follow:

TERMINAL EQUIPMENT

3	ASR35	Bell Model Teletypes
1	ASR33	Bell Model Teletype (to MIT CTSS *Only*)
1	720	Sander's Video Terminal with
1		Hard Copier, and
1		KODAK instructional carrel, and
1	202-C-1	Bell Dataphone

SANDER'S 720 VIDEO TERMINAL EQUIPMENT

722	Keyboard
708	Display
701	Control Unit
1703	Edit Module
1705A	1024 Byte Memory
1714	I/O Module (asynchronous)
1706	Hard Copier Buffer

2706	Adapter
713	Cabinet
706-2	Hard Copier Adapter

KODAK INSTRUCTIONAL CARREL

1		Tape recorder, and
2	carousel	KODAK slide projectors

SOFTWARE

With the Spectra 70/45, RCA provides a software system called Basic Time Sharing System, or BTSS for short. BTSS permits 16 teletypewriter terminals to concurrently access the 70/45. This system consists of three parts: a command language, an edit language, and an interpretive FORTRAN. We can characterize the ISVD systems software problem in terms of two major changes which had to be made in BTSS.

The first change we made in BTSS was to replace the FORTRAN software with something else. This something else, namely, another language, is difficult to describe, first because it is a conglomerate, and second, because it has been in almost constant flux, expanding in capability as ISVD's notion of Prototype I became clearer. At present, this language is unnamed, although we have adopted the practice started by Mrs. Ann Taylor, the member of the computer area most responsible for its development and implementation, of referring to this language as Generalized Language for Understanding and Responding to People (GLURP).

GLURP was inspired by a number of languages each of which possesses aspects of the overall capability needed in ISVD. Its ability to manipulate strings stems mostly from TRAC, the language developed by Calvin Mooers and Peter Deutsch, while its list processing capability is modelled after SLIP, created by Joseph Weizenbaum. Also from Weizenbaum's work, GLURP took the notion of sentence decomposition, recomposition, and those other features that constitute ELIZA. This provides substantial natural language processing capability. In addition, GLURP incorporates a refined version of MINORCA .5, an author language developed by the computer area of ISVD. To all of this GLURP adds a command language for direct access to the data bases by the inquirer as well as certain other features which make it an excellent language for ISVD's first prototype.

But conceiving of GLURP or even programming it to run properly on a Spectra 70/45 computer were not the biggest problems faced in making this language available in ISVD. The problem of putting GLURP in place of FORTRAN in the BTSS environment was considerable. Once GLURP was coded and debugged in batch code, Miss Heather Scott took over the task of sewing it in place. This entailed first the problem of transplanting the software and second of getting GLURP to communicate properly with other components of the overall system. There were, in addition, a host of additional technical problems with which Miss Scott had to be concerned. Once the work of Taylor and Scott was complete, we were ready to consider the second major change to BTSS dictated by the needs of ISVD.

The second change to BTSS made during the year was, in fact, an addition to the basic BTSS software. This addition, which entailed difficulties at least equal to those encountered in implementing GLURP, involved two important functions. The first of these is the direct access and the maintenance of data. This component is called Direct Access Storage Management (DASM). Each data base of ISVD consists of a collection of records and each record consists of files. (For example, the occupation data base contains about 800 records and about 50 fields per record.) The job of DASM, which has been programmed by David Brewster, is to accept the name of a data base and the name of a record and to locate and fetch the appropriate data. Records can be stored, retrieved, located, or altered through DASM without making reference to addresses on disc. DASM contains a hashing procedure which permits data to be stored in locations related to their names, thus facilitating referencing.

The second function to be performed by this addition to BTSS involves the processing of records once they have been retrieved. We call this Hierarchic Access Storage Management (HASM).

Locating values of particular fields, translating codes to English word equivalents and producing lists of records that meet specified conditions, are some of the tasks HASM is designed to perform.

At this point an example will help to visualize the various functions to be performed. A script running under the control of GLURP might require a piece of data. For example, a student might enter the question, "How much does it cost to go to Yale?" The question would be decomposed by ELIZA-like functions in GLURP which would then create a call to DASM of the form College, Yale, Tuition. DASM would retrieve the appropriate record and send it to HASM which would locate the tuition field, check the appropriate de-code table, translate the code into English words, and place those words into a preformed template sentence. GLURP would then transmit this product to the student via the Video Display Terminal.

The foregoing is, of necessity, an oversimplification. Furthermore, activities in the computer area included much more than the two major tasks previously described. Some of these other activities were:

1. Development of data base specifications.
2. Creation of an extensive demonstration of ELIZA capability.
3. Development of detailed specification for MINORCA 1, the refinement and extension of MINORCA .5.
4. Development of software to permit the 720 to communicate with the Spectra 70/45.
5. Creation of an extensive set of multivariate statistical programs for the Spectra 70/45.
6. Provision of software support to adaptation of a paired comparison procedure and to the development of the so-called Hutchinson Procedure.
7. Development of a set of batch programs needed to get the system up.

Two volumes of documentation describing all these activities has been compiled during the year for the use of Principal Investigators and Research Associates.

Activities: Decision-Making and the Generation of Information through Coordination of Secondary Data Files, Computer Processing, and Personal Activities

Decision-Making

INSTRUCTION IN DECISION-MAKING AND ITS COORDINATION WITH PRIMARY DATA FILES

Professional Personnel

Lawrence Lerer, Robert O'Hara, and Eugene Wilson, Directors; Diana Kronstadt, Dorothy Kunberger, James McDade, and Margaret Addis

Summary

The overall plan for constructing scripts in decision-making was presented in the First Annual Report in two sub-sections: decision-making area; and vocational development curriculum area. At this time, it seems advisable to separate this aim in this sub-section according to its function, namely instruction in decision-making and its coordination with *primary* data files. The overall plan for constructing *instruction* in decision-making therefore presently consists of the following general phases:

June 1966—August 1967	1. Construct and field test decision-making booklet for junior high school. Specify behavioral goals and write necessary scripts
September—November 1967	2. Organize, winnow, and edit scripts
December 1967—February 1968	3. Revise scripts, add needed scripts, and provide scripting of interchanges among scripts as well as data assembly for MONITOR
March—June 1968	4. Implement 3 as Prototype I

July—August 1968	5. Do restricted field-testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	6. Implement Prototype II
January—May 1969	7. Field test Prototype II

Phases 1 and 2 are completed. During the Seventh Quarter a final version of scripts in the area of Self and Deciding was prepared and reviewed as required for Phase 3. Scripts are presently available for Phase 4.

ORGANIZATION OF INSTRUCTIONAL SCRIPTS

Scripts prepared during the Fifth Quarter were first carefully read and categorized according both to level (elementary, junior high, senior high, college) and their location in "A Tentative Classification Scheme for the ISVD Scripts" and in the Access Routines of REVIEW, EXPLORATION and CLARIFICATION. The scripts are distributed in the following categories of the above noted classification scheme:

1. Vocational Planning Program. Designed to make explicit the Tiedeman-O'Hara decision-making paradigm, a group of scripts has been prepared, primarily for the elementary level, which deal with self and the use of self-evaluation in decision-making. These scripts offer both a suggested perceptual framework associated with the delineation of a discontinuity, and concepts of decision-making as potential coping strategies in influencing decision-making.

2. Personal characteristics. Scripts in this category focused on teaching about dimensions of self through dimensions of interests, abilities, and values. They are primarily appropriate for the junior and senior high school levels.

3. Education and Training. The scripts in this area are designed to acquaint inquirers with concepts related to education and training in schools, industry, and the military. Closely related to the appropriate data files (occupation, education and military) these

scripts are essentially intended for senior high school and college level inquirers.

4. Occupations. Scripts in this area are concerned with helping inquirers gain insights as to why people work, results of particular type of work activities, and implications of work upon "style of life."

The above classification scheme and the original script writing activity did not produce a complete system. Therefore, scripts were next reorganized into the following categories:

a) Attributes of An Agent
b) Self and Decision-Making
c) Self Attributes and Deciding
d) Economics and Employment
e) Educational Choices
f) Occupational Choices
g) Placement

SCRIPTS FOR SELF AND DECISION-MAKING

Instructional scripts in all areas except that of b) Self and Decisoin-Making are referred to in other areas of the Report because they are more related to other functions according to which the areas of this Report are organized. A flow chart was developed for category b) during the year and is reported in Appendix III. A flow chart indicates the essential relationships among scripts within an area.

PRACTICE IN DECISION-MAKING THROUGH GAMES AND ITS COORDINATION WITH PRIMARY DATA FILES

Professional Personnel

Eugene Wilson and Allan Ellis, Directors; Susan Baldwin, Charles Gunnoe, Diana Kronstadt, Dorothy Kunberger, James McDade, and Margaret Pincus

Coordinating Researchers

William Mittlestadt and Keith Whitmore, Eastman Kodak Co.

Sub-Contractor

Abt Associates

Summary

The overall plan for constructing the Decision-Making Curriculum consists of the following general phases:

June 1966—August 1967	1. Construct and field test decision-making booklet for junior high school
September 1966—August 1967	2. Survey career games
September—November 1967	3. Plan educational, career planning, and achievement motive games
December 1967—February 1968	4. Prepare scripts called for in 3 above
March—June 1968	5. Implement 4 above as Prototype I
July—August 1968	6. Do restricted field testing of Prototype I to develop specification
January—May 1969	7. Field test Prototype II

The year began with several activities listed under the heading of "Decision-making Area" (a curriculum unit, the Abt Machinist Simulation, script-writing, and game construction) and ended under the above heading with activities focused on only two activities, modification of the Life Career Game and provision of an achievement motive game. The curriculum development and script-writing activities are now listed under other areas of the project, and work on the Abt Machinist Simulation was halted to place top priority on the modification of the Life Career Game and provision of the achievement motive game.

Phase I has been completed. Completion of Phase 2 led to the decision to implement a revised version of Sarane Boocock's Life Career Game. It also included the commissioning, construction and delivery by Abt Associates of Machinist Career Game for adult levels. McClelland's achievement motive games were also singled out for implementation.

Six out of seven of the major scripts for the Life Career Game were written and are now being revised. Additional "skeleton" scripts for playing each round of the game are being written. Scripts for an achievement motive game are under construction.

ABT MACHINIST CAREER SIMULATION

During the Fifth Quarter, Abt Associates delivered a first version of a Machinist Career Simulation. Evaluation by the ISVD staff resulted in the conviction that the simulation lacked the capacity to transmit adequate feeling for the activities involved in each of the machinist occupations depicted. At the time the computer staff was not implementing further materials, and the Machinist Simulation was therefore delegated to Prototype II for further development. At that time we plan to develop movie film cartridges to depict each of the alternatives open to an individual at each choice point and thus create a system to simulate movement through a series of related occupations in the machinist area. It is hoped that the addition of sound, color, and motion pictures will increase the non-verbal impact of the System and will make it particularly effective with disadvantaged users in low-income school districts, as well as in non-school settings such as Job Corps Centers, YMCA's, settlement houses and employment offices.

MODIFICATION OF LIFE CAREER GAME

Most of the Seventh and Eighth Quarters have been spent in modifying the Life Career Game for use in the ISVD. These modifications have involved writing materials for scripts, specifying what is desired in visuals (both still and motion, graphics and photography), specifying the data files, and changing the existing scoring system.

The Life Career Game was chosen for central use in the ISVD because it allows a player to exercise choice in the areas of school, work, and leisure. Within the structure of the game, a player makes choices for a hypothetical person for whom he is given a "profile" containing data pertaining to abilities, interests, and values. Although the player may expend considerable time seeking data, at some point in time in order to play the game he must make decisions based upon what information he has acquired, and he must live with the consequences of those decisions. The Life Career Game structures the practice of a process which is measured by Gribbons Readiness for Vocational Planning instrument. The scoring system is designed to reward the player for combining the largest set of data relevant to a given circumstance as he makes the decision. This is the process the ISVD is seeking to promote and facilitate. An awareness of this process on the user's part constitutes success for the System.

The Life Career Game is central to the ISVD also in that it provides an organizing structure to all of the anticipatory materials that are available in the System. Through playing the game, users are inducted into the System itself and eventually learn to interact with scripts, seek information from the data files, and set their own criteria for monitoring their own progress without the structure of the game.

Plans for the visual components of the Life Career Game scripts have been developed with the cooperation of people from the Eastman Kodak Company. Mr. William Mittlestadt and Dr. Keith Whitmore of Kodak have consulted with Eugene Wilson and Susan Baldwin of ISVD to establish the principles which have governed the development of visuals.

ACHIEVEMENT MOTIVATION DEVELOPMENT

A significant similarity exists between many of the strategies characteristic of one with a high need for achievement (n-Ach) and one whose behavior and value system is described by Tiedeman's "Sense of Agency." Realistic goal setting, moderate risk taking, use of feedback, and assuming responsibility for the initiation of action exemplify this correspondence.

The Alschuler-McClelland Achievement Motivation Development

Project has experimented with various techniques helpful in developing these strategies. Those techniques provide models for the following procedures within the ISVD:

1. A computer game which allows the inquirer to experience the effects of these strategies.
2. A personal change script which allows the inquirer to specify a goal, plan strategies for its attainment, periodically assess his own progress, and re-examine or reformulate the goal in light of his experience. The inquirer is allowed in this way to experience in his ongoing activities, the organizing of relationships upon which his formal interactions with the contents of the System are based. Scripts for an achievement motivation game are now being planned.

Psychology

DECIDING AND VOCATIONAL DEVELOPMENT AND THEIR COORDINATION THROUGH SECONDARY DATA FILES

Professional Personnel

Duncan Circle, Lawrence Lerer, Robert O'Hara, and David Tiedeman, Directors; Allan Ellis, Elaine Fisher, Wallace Fletcher, Thomas Hutchinson, Diana Kronstadt, Dorothy Kunberger, James Mc Dade, Margaret Pincus, Terence O'Mahoney, and Eugene Wilson

Summary

The First Annual Report and its two subsequent Quarterly Reports dealt with the areas of inquirer characteristics data file, general curriculum, and vocational development curriculum. These three areas are somewhat differently defined in this Report and are also treated somewhat simultaneously.

The differences in treatment include:

A. Inquirer Characteristics are divided into two kinds, general and personal. General inquirer characteristics are of course personal but their use in the ISVD is intended for a more general audience than the inquirer himself. The two audiences which will be permitted access to these general characteristics are other inquirers, when the characteristics of all inquirers are treated anonymously, and counselors, when the characteristics of a specific inquirer are identified by his name. This latter use category will provide for traditionally permitted access to cumulated grades and other data on the educational progress of student inquirers. General inquirer characteristics are now reported in this sub-section. Personal inquirer characteristics will be reported in the sub-section immediately following.

B. The purpose of the so-called General Curriculum is more sharply focussed. ISVD interest in the General Curriculum will henceforth be only twofold. On the one hand, ISVD will provide categorizations of terms in primary data files which permit access at a more functional level than the descriptions of the activities themselves. This level of cross-referencing is already somewhat inherent in the *primary* data files as presently organized. However, the *primary* organization was planned and implemented without explicit attention to the coordination of categories when the use demanded is conceived in terms of vocational and/or agency development. It is this coordination which represents the present second interest of ISVD in the general curriculum. This is why the general curriculum is sequenced in this Report between consideration of inquirer characteristics and the Self Attributes and Deciding instructional scripts.

C. The Vocational Development Curriculum is here limited to instruction in self attributes and their relation to educational and vocational opportunities. This instruction is being assembled in scripts here referred to as those on Self Attributes and Deciding.

The overall plan for coordination of deciding and vocational development through secondary data files is presently conceived according to the following general phases which are somewhat specific to the origins of the three parts of the now combined task as is noted in the headings of each of the last three columns:

	A. *Inquirer Characteristics: General*	B. *Cross-Referencing of Data Files: General*	C. *Self Attributes and Deciding*
June 1966—November 1967	A.1. Plan cumulative record file and collect and code data for subjects likely to be used in field test of Prototype II	B.1. Survey for study-work links for use in cross referencing of education, occupation, and inquirer characteristics data files	C.1. Write behavioral specifications. Write scripts. Organize, winnow, and edit scripts
December 1967—June 1968	A.2. Implement cumulative record. Provide Durstine-Wolff type of retrieval capacity. Provide for merging and subsequent accessing of inquirer characteristics secured from vocational development, decision-making, general education, and psychological curricula.	B.2. Provide and do cross-referencing of education occupation, and inquirer characteristics data files	C.2. Revise scripts, add needed scripts, and provide scripting of interchanges among scripts as well as data assembly for MONITOR
July—August 1968	A.3. Implement Phases 2 and 3 above as Prototype I and engage in limited field trials to secure specification modifications of file for Prototype II	B.3. Implement 2 for Prototype I and engage in limited field testing of Prototype I to develop specification modifications for Prototype II	C.3. Implement 3 as Prototype I and engage in limited field testing of Prototype I to develop specifications for Protype II
September—December 1968	A.4. Implement Prototype II file	B.4. Implement Prototype II	C.4. Implement Prototype II
January—May 1969	A.5. Field test Prototype II	B.5. Field test Prototype II	C.5. Field test Prototype II

Phases A.1., B.1., and C.1. are completed. During the current year work progressed on Phases A.2., B.2., and C.2. However, greater emphasis was given to Phase C.2. than to the others. Consequently primary attention in the next several months must move to Phases A.2. and B.2. and necessary subsequent revisions in scripts associated with Phase C.2. will then have to be accomplished in a coordinate fashion.

Inquirer Characteristics: General

FOLLOW-UP STUDIES

The comprehensive follow-up studies which were completed the last two years were not duplicated this year as these two have provided the basic type of information needed on graduates who were two years and seven years out of high school. Both Newton high schools did follow-up studies of their graduates of 1967 during the fall and winter of 1967. This included their former Bigelow Junior High students, the students who will be included in the field test. A random sample of students who have been out of high school four and a half years has been selected and it is planned to evaluate in some detail their post-high school educational pattern, including original major and eventual major as related to high school courses. Also, the relationship between high school and college grades will be available. This is only a limited study to test its feasibility and usefulness. The information should be of value for predictive purposes and college simulation.

STUDENT CHARACTERISTICS

Test data are still being added to the digitek forms as they become available during the year on the present and former students at Bigelow Junior High School. Complete information has also now been coded on the new seventh grade class. A new digitek sheet has been designed and is now in use for recording the high school grades and credits of the former students at Bigelow who are now at Newton High School. This information will be available for simulation and prediction of high school and junior high school inquirers. For those students who are actual inquirers it will provide their characteristics which are an important part of the vocational decision-making.

Cross-Referencing of Data Files

As data files were developed during this present year, links among educational categories themselves, among occupational categories themselves, among military categories themselves, and among inquirer characteristics categories themselves, were created. In addition, cross-referencing among categories in all these files has been facilitated as use is anticipated. However, additional cross-referencing becomes necessary as additional uses of *primary* data files are planned. This *additional* cross-referencing has been undertaken in conjunction with the planning of the then necessary subsidiary data files.

Self Attributes and Deciding

INSTRUCTION IN SELF ATTRIBUTES AND DECIDING

As previously mentioned a group of scripts drafted during the Fifth Quarter has been isolated and organized in the unit, Self Attributes and Deciding. The scripts in this unit are presently organized as noted in one of the flow charts of Appendix III. At this time the area of values (in Self Attributes and Deciding) is not fully flow charted and is therefore not included in the most recent chart for that area. Values will serve as the overarching concept in the area of Self Attributes and Deciding, and must wait on the completion of Interests and Abilities for final definition.

Three charts have been prepared indicating the degree to which Readiness for Vocational Planning, Test of Occupational Knowledge, and Role Repertory elements are found in existing scripts. Links have been written into several scripts which permit inquirers to explore each of the above noted concepts.

Intensive effort has been given to the preparation of new scripts, utilizing the newer versions of MINORCA and the adjusted capabilities of ELIZA. Toward this end, "Keyword Lists" have been prepared in the categories of Decision, Personal, Educational, Occupational/Vocational, Interests, Abilities, and Values. Close coordination with programmers and staff of Sanders Associates has also resulted in development of scripts incorporating a variety of previously unplanned functions which will offer increased control and power to inquirers.

Arrangements for incorporation of audio-visual material into script content are completed, and current activity involves identification of appropriate audio-visuals (primarily slides) and their integration into the content of existing and planned scripts. Revision of existing scripts has involved inclusion of access frames to Occupation, Education, and Military Data Files, and additional script-writing has resulted in increase of possible linking to these data files.

Scripts in the areas of Self and Decision-Making and Self Attributes and Deciding are currently awaiting implementation.

SYSTEM EXPANSION BY WAY OF MULTIMEDIA USES

During the present year the possibility of incorporating audio-visual materials into written materials in existing and planned scripts has been explored. Working closely with Sanders Associates and the Eastman Kodak Company, media configuration at the ISVD stations have been developed. In addition to cathode ray tube, keyboard, and hard copy print-out, there will be available random access slide, linear sequential audio, and linear sequential film capabilities. To fulfill the promise of this peripheral equipment, Mrs. Elaine Fisher has undertaken the task of identifying and developing materials appropriate in both content and philosophical orientation to the needs of ISVD.

Following a survey of audio-visual resources available at the Career Resources Center, Newton, Massachusetts, and the Audio-Visual Center of Harvard University, the following additional resources are being utilized.

Guidance Associates of Pleasantville, New York have made available their library of slides and filmstrips. In addition, arrangements are currently being completed for use of their production staff in development of new materials specifically for ISVD. General Learning Corporation continues to explore with us the suitability of their audio-visual resources, and arrangements are being made to facilitate incorporation of appropriate resources into ISVD. The United States' Army, Navy, and Air Corps have already offered sets of slides illustrating training and educational opportunities in the military for incorporation into the military data file. Efforts are being made to obtain films and additional slides from these sources. Contemporary Films of McGraw Hill and Company have made films available to us on an "extended preview" basis. Slides from the Boston Museum of Fine Arts are to be incorporated into the teaching scripts. Mrs. Fisher has created a set of original slides for use in the areas of Self and Decision-Making and Self Attributes and Deciding.

In addition to continued involvement with all of the above, future plans include explorations with the Educational Testing Service, College Entrance Examination Board, Psychological Corporation, Harcourt, Brace, and World, National Cash Register Company, and the United States Department of Labor.

Incorporation of multimedia resources into Prototype I has already occurred during the present year, and future plans involve increased incorporation of such materials into the data files, teaching scripts, and simulation and gaming components of ISVD.

HEURISTICS OF SELF-CONCEPT AND VOCATION

O'Mahoney's paired-comparisons procedure for the dimensioning of self-concepts blends the projective technique typified by the Murray T.A.T. and the objective observational technique of a paired-comparison procedure to obtain a set of profiles of self dimensions as well as other statistical indices of self-concept.

A set of nine pictures is used. These have been carefully selected from a pool of 92. The pictures are of adult males performing various occupational tasks. The occupational settings may give some clues as to the general occupational area involved but are ambiguous enough to allow, and require, interpretation on the part of the inquirer to effect closure.

In terms of an empirically derived occupational classification, the "meaning-focus" and "meaning-range" of these pictures has been established. Thus we were able to select sets of nine which, together, allowed association with the whole range of 24 categories.

SELF DIMENSIONING

In the self dimensioning procedure, as used in ISVD, the projective part will be conducted off-line owing to the difficulties of programming 'non-directive' personal interaction for the console. The more mechanical paired-comparisons section has been programmed.

The projective-type procedure consists of displaying the pictures individually and asking the subject to describe the persons depicted. He is encouraged to do this in terms of personality and character traits as far as possible. Responses are recorded verbatim. When the respondent is satisfied that he has said all he is able to say about the pictures these are temporarily discarded.

He next analyzes *his own* responses in terms of recurrent themes and concepts. The burden of this analysis is his entirely, he receives only procedural guidance from the investigator, who throughout avoids any form of interpretive interference. The meanings of terms used *must* remain the respondent's meanings. The investigator is not interested in the 'rightness' or 'wrongness' of the terms used. His only concern is to see that the administrative requirements are satisfied as well as possible. There are three levels of abstraction required by the procedure; at times a respondent has to be led through each step consecutively, at other times a respondent will skip automatically from a lower to a higher level without prompting.

The end product of this dimensioning phase of the procedure is a list of the psycho-semantic dimensions along which the respondent differentiates people, one from another. He is required to explicitly agree that the list is representative and acceptable to him. He is asked to indicate, where possible, the evaluative associations he has with these dimensions; which 'end' is the 'desirable' end. Next, he ranks the dimensions in order of importance for him; finally he rates himself on each dimension on a nine-point scale.

PAIRED-COMPARISONS

The list of dimensions is next put into the computer. Pictures are displayed in pairs such that each picture is paired with each other picture once, 36 pairs in all. These pairs, on slides, are displayed by way of the Kodak Console. They are labeled "L" and "R" and the inquirer responds in terms of his preference. For a series of 36 pairs one Dimension Label (his own psycho-semantic dimension) is displayed on the CRT and it is in terms of this that his preference and response is made. Thus, if the Dimension Label is "Aggressive" his response to each pair of pictures indicates which of the two persons depicted he views as more aggressive. His responses made at the CRT console, are recorded by the computer and as soon as the response set is complete the machine begins the following calculations.

a) Statistical Test of Equivalence—to decide whether it is valid to seek a rank order.
b) If test a) proves satisfactory, rank order of the nine pictures for this dimension.
c) 1. Coefficient of Consistence—to establish the degree to which this individual is able to apply his dimension-concept consistently or uni-dimensionally.
   2. Significance of Coefficient of Consistence.

If the coefficient of consistence is non-significant the program identifies the inconsistent responses, presents the relevant slides for re-judgment and recomputes the coefficient and significance level. If coefficient of consistence still is non-significant that set of responses—that dimension—is abandoned for the purposes of further computations, although retained for its heuristic, and, possibly, counseling value.

A new Dimension Label is displayed, the same 36 slides are projected requiring the inquirer to judge between the pictures of each pair in terms of the new Dimension Label. The same statistical computations are performed. The process continues until the individual has, in this fashion, operationally defined each of his dimensions. He is then required to operate with certain self-relevant dimensions or concepts, such as: "Most like Self as a Person in General," "Most like my Ideal for Myself," "Most like the kind of Person I am at Work." Response-sets, or matrices, for these concepts are treated statistically as are the others.

When all the raw response matrices are available the machine is able to compute coefficients of agreement between any matrix and any other. Thus, it is possible to arrive at a correlation between the "Self in General" response set and each of the respondent's personal dimensions in turn; this allows a profile to be drawn. A similar procedure is followed for each of the other self-relevant concepts.

Furthermore, canonical correlations may be computed both from the coefficients of agreement and from the rank orders of the pictures for a reduced set of the personal dimensions and the self dimensions. It has yet to be established which of these methods is more economical and fruitful than the other.

The above capabilities will be available for Prototype I. For Prototype II, it should be possible to investigate the possibility of reducing both the time and effort required for the paired-comparisons procedure.

As has been suggested previously, it should also be possible, using the same procedural pattern but different pictures, to investigate other aspects of the self process such as "Self as Member of Family," "Self as Student," "Self as Member of Society" (or some sub-group thereof), "Self as Agent." This will require careful investigation and analysis of the multitude of relevant pictures available.

A female version of the Occupational Picture Set and others, could be developed as well as versions for ethnic groups.

PICTURE INTEREST INVENTORIES AND THE HEURISTICS OF SELF-CONCEPT AND LIFE'S OPPORTUNITIES

Obviously, the paired comparison procedure provides both an almost vernier-like measurement of interest within the visualized domain of the picture set and the means of linking interests and self-concept. As the ISVD develops, plans at least will be laid for more global explorations of interests than those now possible by use of the paired comparison technique alone. These more global explorations will be planned as picture interest inventories in the several domains of time investment considered in ISVD, namely, education, military service, vocation, and family living. Paired comparison procedures will be planned in coordination with those general picture interest inventories to permit both further differentiation of interests and the heuristic exploration of self-concept and the particular kind of activity.

In conjunction with the further heuristic explorations of self-concept and various kinds of activities, the overlap, if any, between different aspects of self process should be investigated. This would be possible in terms of recurrent personal dimensions if the different sets of pictures as referred to above were available. This should then make it possible to make some definite statements (or hypotheses) about the inter-relationships of various aspects of the self process, such as the extent to which "Self as X" (where X is an occupational title) is associated with "Self as Family Man," or "Self as Male," or "Self as Student," or "Self as I should Like to Be (Ideal)," or "Self as Agent."

These inquiries must undoubtedly go far beyond Prototype II in time, but they will probably be initiated in relation to Prototype II. A more relevant possibility is that of investigating the use of the results of the procedure as an heuristic device which may help to guide both the student and ISVD in planning the inquirer's accessing behavior to the System. From the profiles, rank orders, coefficients of agreement, canonical correlations, and the inquirer's evaluations of, and response to these it may be possible to formulate plans for probably-fruitful lines of inquiry in the System.

HEURISTICS OF DESIRES AND CAPABILITIES

Technical Memorandum No. 3 describes Hutchinson's procedure for permitting inquirers to select what they want from a particular opportunity and then to determine from measures of required capabilities whether their desires are within the possibility ball park or not. An example of this procedure now operates in the batch-processing mode.

The purposes of the batch mode system were to provide a more realistic demonstration of the model, to provide information about the feasibility of the model, and to gain some experience in using the model with real subjects.

Data were made available by Project TALENT. The data are a subset of the Twelfth-Grade Five Year Follow-up of the original Project TALENT sample.

Data were requested for five vocational groups which are called Sales, Secretarial, Electrical-Mechanical, Structural, and General Labor. The selection of groups was made on the basis of the sizes of these groups in the total Project TALENT survey.

VALUE VARIABLES

There were only two value variables available from the Project TALENT Data. Both were used in this study. The amount of money earned per week was used. The other value variable was the number of hours worked per week. No subject with missing items of data on these dimensions was included in the comparison group.

PREDICTOR VARIABLES

The predictor variables were chosen from the Project TALENT tests that had been administered to the comparative sample when they were in high school. The variables were selected such that the total testing time for the subjects would be reasonable (38 minutes), all tests were in the same test booklet, and the variables had shown difference among some of the jobs that are included in the vocational groups.

The tests used were mechanical reasoning (ME), visualizing in two dimensions (V2D), creativity (C), and clerical checking (CC). No member with missing data on these variables was used in the comparative sample.

THE COMPUTER PROGRAM

A computer program for centour analysis among flexibly determined subgroups was written. The program is specialized for this particular comparison sample. The program does only the bare essentials of centour analysis, i.e., it forms subgroups according to the cutting points defined by the subjects, eliminates subgroups of less than 50 in membership, and computes for that subject the chisquare associated with each remaining subgroup.

THE SUBJECTS

Nineteen students from North Reading High School, North Reading, Massachusetts have participated in the field study. Of these nineteen, eighteen were juniors and one was a senior. All nineteen were students not planning to go on to a four-year college. Since the comparison group did not contain workers who normally attend college it was felt that it would be more meaningful to these students than to a cross-section of students.

On the dimension of the amount of money earned per week the range was from $100 to $250. These choices do not seem to be realistic for this group of subjects. The cutting points resulted in there being many successful subgroups with very few members. The nineteen subjects were tested on the four Project TALENT tests.

The cutting points selected by the nineteen subjects did result in their being many subgroups not entered into the predictor variable space. The average number of subgroups entered into that space was 6.96. Since there were ten possible subgroups the probability of subgroup existence was .695, considerably less than ideal.

The chisquares that were computed for these nineteen subjects are generally low. That shows that these students as a group resemble the vocational groups with which they were compared. Since the nineteen subjects are not college bound, the results are consistent with what we would expect.

The range of scores for each inquirer shows good differentiation among subgroups. As would be expected there is more differentiation among subgroups of the same group. Even this latter differentiation appears to be satisfactory.

The subjects show considerable variability among themselves with respect to how much they resemble different subgroups. Table A gives the order of the scores each subject obtained. The number one indicates the subgroup the subjects looks most like and the highest number is for that subgroup the counselee least resembles.

TABLE A

The Order of the Subgroup Scores for Each Subject

	Sales		*Secretarial*		*Electrical-Mechanical*		*Structural*		*General Labor*	
	S	U	S	U	S	U	S	U	S	U
01	7	3	–	1	8	6	4	5	–	1
02	–	2	–	3	–	6	4	5	–	1
03	–	5	–	6	–	3	1	2	–	4
04	–	4	–	6	–	1	3	1	–	5
05	3	5	9	8	6	2	1	3	–	7
06	–	4	–	5	–	2	–	1	–	3
07	3	7	–	8	1	2	4	5	–	6
08	–	1	–	5	–	2	–	3	–	4
09	–	3	–	6	–	1	2	4	–	5
10	3	7	–	8	1	2	5	4	–	6
11	–	2	–	5	–	1	–	3	–	4
12	–	4	–	5	–	3	–	1	–	2
13	–	4	–	5	–	1	–	2	–	3
14	–	2	–	5	–	1	–	3	–	4
15	–	3	–	2	–	5	–	4	–	1
16	8	4	5	2	10	9	6	7	3	1
17	9	3	4	1	10	8	7	6	5	2
18	1	6	9	10	3	2	4	5	6	8
19	7	8	10	9	3	2	4	5	1	6

For every subgroup except unsuccessful secretarial at least one subject had his lowest score in that subgroup. The higher scores were also spread over the subgroups.

The average amount of computer time that was used for each subject was 5.6 minutes. Most of the computer time was used in reading or rewinding the tape on which the data for the comparative sample were written. The rewind time can be eliminated by having two input tapes available. Much of the reading time can be eliminated by changing the unblocked formatted tape to a highly blocked unformatted data tape. Since the program is only 40,040 bytes long it may also be possible to change the program to do more than one subject simultaneously. Thus there remains a number of ways of decreasing the computer time required.

As the RCA Spectra 70/45 is reprogrammed and the statistical package inserted into its time sharing capability, further experiments will be conducted within ISVD to determine how far we can go in including this heuristic exploration of values, capabilities, and opportunities within the on-line design of the System. It is possible that some of this activity might have to take place off-line in batch processing mode with approximately 24 hours becoming the elapsed time between inquiry and response from the computer.

DECIDING AND AGENCY DEVELOPMENT AND THEIR COORDINATION THROUGH *SECONDARY* DATA FILES

Professional Personnel

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Summary

The overall plan for designing the system to facilitate emergence of agency behavior through repeated interaction in ISVD consists of the following general phases:

June 1966—August 1967	1. Provide general theory on thought, choice, and action
September—November 1967	2. Specify sense of agency. Test scripts against concept. Plan for additional scripts and assessment and storage of assessments

December 1967— February 1968	3. Write additional scripts. Continue planning on psychology and ISVD
March—June 1968	4 Implement Phases 2 and 3 as Prototype I
July—August 1968	5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September— December 1968	6. Implement Prototype II
January—May 1969	7. Field test Prototype II

Phases 1 and 2 have been completed in detail sufficient for Prototype I. Particular attention was given during the Seventh and Eighth Quarters to the further differentiation of plans for permitting the operation of personal psychology within the design of ISVD. The results of this planning are already a part both of the introduction of this Report and of the influence of that introduction on the organization of the project's activities as herein reported.

PLANNING SEMINARS

The personnel in this area met fairly regularly during the year in order to form the plan which underlies the theory and organization of this Report. Discussions focussed on the emergence of a tacit and explicit congruence between the objectives and the operational procedures of the ISVD. Gannaway has undertaken the drafting of a working paper intended to make operational the theory of thought, choice, and action as originally assembled by Tiedeman and Dudley.

INSTRUCTION IN THE ATTRIBUTES OF AN AGENT

A set of scripts dealing with the Attributes of an Agent has been separated from those originally written during the Fifth Quarter. These scripts are primarily intended for children. They are being reviewed and revised. Revision involves both making sure that they are consistent in their form with the general theory of agency behavior and providing the necessary bridging types of frames which make the originally disjointed set of scripts operate as a sub-system. This activity is not now complete because personnel had to devote more time to evolving the overall plan than was originally anticipated. However, the task is now assigned. The task will be undertaken both to achieve an operating set of scripts for children and to plan for needed instruction in agency behavior at later ages.

We will focus our efforts toward tacit understanding of agency behavior in the following content areas: work habits and activity patterns, readiness to consider and make personal plans, decision-making skills. The pedagogical modes we employ will both teach *about* these concepts and allow for an inquirer's *experiential* discovery and manipulation of them.

SYSTEM ORIENTATION IN AN ELIZA-LIKE MODE

In September 1966, Ellis and Wetherell made a review of some of the existing interactive computer languages (The Computer and Career Decisions, Technical Memorandum No. 1). The conclusion of that review was that none of the languages had all of the capabilities desired for the writing of ISVD guidance materials.

Since it was apparent that the guidance staff needed some way to communicate explicitly its desires on the interaction between inquirer and computer, members of the computer staff developed a new language, MINORCA.

A script-writing language, MINORCA, allows an author to specify the content of a particular lesson, the flow of conversation, and the needed computer processes. The language provided for the use of the cathode ray tube, slides, audio devices, and a teletypewriter keyboard. Based on the CAI concept of the *frame* where text is presented to the inquirer in a general theory of question-answer interaction, it was possible on the one hand for the inquirer to ask a question and receive an answer while on the other hand, the System could pose a question to the inquirer and interpret his response.

In the Fifth Quarter, thirty-three scriptwriters, mainly guidance counselors and teachers, were hired on a temporary basis. Using a paper and pencil version of MINORCA, their task was to write some of the concept teaching scripts. The results of this special effort indicated that MINORCA was not used to its full capabilities and that the natural language component would have to be improved.

It was with these thoughts in mind that the decision to explore the capabilities of ELIZA (see the second part of Section II) was made. The major task was to write demonstration scripts for the ISVD ORIENTATION, EXPLORATION and CLARIFICATION.

The ISVD ORIENTATION is *not* conceived in the usual sense of the word as *first* either acquainting the inquirer with the existing situation or giving him an overview of the System. In keeping with ISVD guidance theory, it is instead designed to *allow* the inquirer to explore or find out for himself what he can or cannot do in the System. The orientation takes place as a process *in* exploration, not as instruction *before* exploration.

Used as the main calling or access script, ORIENTATION begins flatly with the question "What would you like to do today?" Even the inquirer might be stunned at the openness of the question. He can answer anything! However, the computer cannot recognize every possible response that he can give. When we talk about getting a guidance machine to understand English we must mean understanding within a limited context and in this case the context is ISVD. The responses given by an inquirer that would be recognized by the machine are limited by the alternatives available in the System.

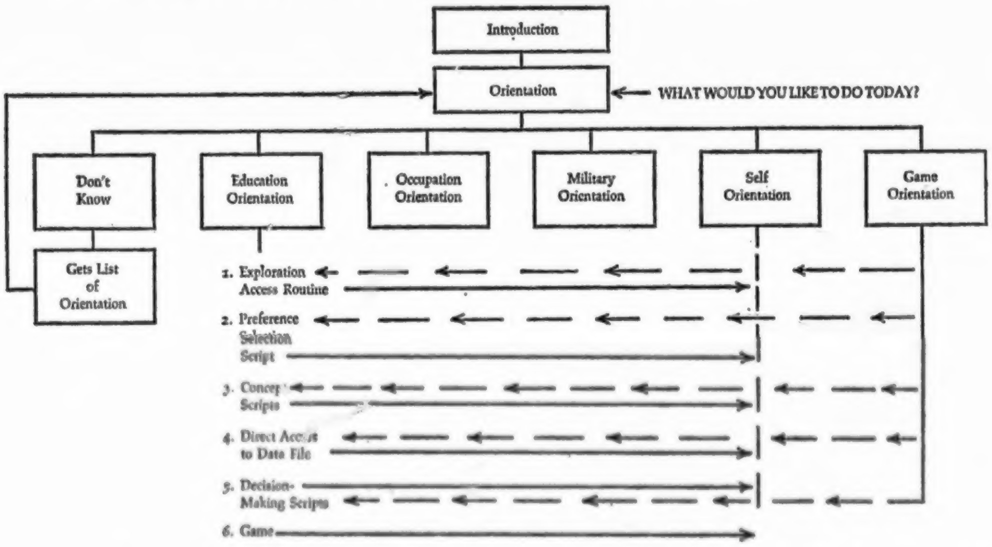
In the *demonstration* ORIENTATION script the keywords refer to colleges, occupations, the military, and the Life Career Game. The decomposition rules are designed to transfer control out of the script to appropriate materials: accessing one of the data files, playing the Life Career Game, going through a particular preference/selection script, going through the Access Routines of EXPLORATION and CLARIFICATION. In Prototype I ORIENTATION, this *demonstration* script must be enlarged to include all available ISVD activities.

Limited by core storage of the MIT computer, the demonstration script could not handle all the keywords and decomposition rules necessary to provide for all alternatives available in the ISVD System. It is even doubtful that, given the format of the ELIZA script, the RCA Spectra can deal with the total context. If so, compromises with the theory will just have to be made.

It became necessary then to transcend ELIZA in order to devise a system of access that would allow an inquirer to get any part of the System from the major orientation script.

The following is based on the diagram below and describes our tentative scheme of access:

C: WHAT WOULD YOU LIKE TO DO TODAY?


Introduction
Orientation
WHAT WOULD YOU LIKE TO DO TODAY?
Don't Know
Education Orientation
Occupation Orientation
Military Orientation
Self Orientation
Game Orientation
Gets List of Orientation
1. Exploration Access Routine
2. Preference Selection Script
3. Concept Scripts
4. Direct Access to Data File
5. Decision-Making Scripts
6. Game

It was decided to teach the inquirer a set of commands that would allow him to control the flow of conversation. These commands are designed to allow the inquirer to stop the activity which he is presently engaged in and to choose another one, to quit the system entirely, to get direct access to one of the data files, to get help on material that he does not understand, and to get a summary of what he has done in the System. The script that teaches him these commands is called INTRODUCTION.

From INTRODUCTION the inquirer goes to ORIENTATION which asks him what he wants to do. This script contains only keywords which transfer control to appropriate minor orientation scripts. These scripts contain all the decomposition rules for accessing activities that reflect the intent of the keyword found in the major orientation script. For example, take this sample interaction:

S: I'd like to think about which colleges to apply to.

The keyword *colleges* is picked up in the major ORIENTATION script and control is transferred to the education orientation script for reprocessing of the inquirer's input. A decomposition rule matches and control is transferred to the appropriate material.

(ϕ think about ϕ colleges ϕ apply to ϕ) go to EXPLORATION.

If an inquirer does not know what he wants to do or asks what is available he can get a list of activities and then is looped back to the MAJOR ORIENTATION script.

Within each minor orientation script there are six alternatives which are common to all except for the game. The playing of the game will allow access to any of the 24 major parts of the System and the game can be accessed from any of those parts.

To summarize then, the purpose of the ORIENTATION scripts is to pinpoint exactly what it is the inquirer wishes to do and to transfer control to the requested materials.

ORIENTING ASSESSMENT INTERVIEW

The ISVD will eventually operate with inquirers who have interacted with the System many times. For these inquirers, the data stored in MONITOR will provide the resource for present monitoring of the inquiry. However, in organizing the System we must also plan for inquirers who have not interacted with it beforehand. These persons are presently being planned for in terms of an interview useable at adult years in life. The framework inherent in the *California Life Goals Evaluation Schedules* and in *Planning Ahead After 40*, both of which are the work of Milton E. Hahn, is guiding the construction of these assessment interviews. This interview must eventually coordinate both with the emerging scripts on Self Attributes and Deciding and with other assessments appropriate at younger ages.

ORIENTATION BY WAY OF TESTS

Occupational knowledge, vocational planning, vocational maturity, and agency maturity are all qualities which the ISVD attempts to encourage. McSherry and O'Hara have a Test of Occupational Knowledge, Gribbons a schedule of Readiness for Vocational Planning, Crites a test of Vocational Maturity, and Kelly a Role Repertory Test. Use of all of these tests will be designed into the ISVD to the extent that such is possible. One aspect of the design will be direct administration of the instruments themselves either offline or on-line according as the feasibility of on-line testing becomes more apparent in our field test. The other aspect of the design will be to plan data files, game playing, and deciding in as close correspondence with these test dimensions as is possible. We hope that this aspect will eventually lead to parts of the test themselves being incorporated into MONITOR.

NATURAL LANGUAGE PROCESSING FOR DECISIONAL FRAMEWORKS IN AGENCY DEVELOPMENT AND MONITORING

Several previous parts of this section have dealt with the types of structured interactions within the "concept teaching" mode of the ISVD which are planned to provide pedagogically sound examples of the sense of agency in operation. While access to such external referents is a useful and necessary part of becoming an agent, particularly in early stages of agency development and vocational maturity, it cannot be considered a sufficient condition for the internalization of agency characteristics and their application to real-life decisions. Sense of agency is, by definition a *process*, or rather, a conception of self-as-process, and therefore needs to be experienced as part of oneself, and used by oneself, in order to become an effective aspect of maturity in decision-making. This use-context is, in fact, a major rationale for the design of the ISVD, in that supervised practice in decision-making is planned as the laboratory in which such concepts as sense of agency become realized for inquirers.

Simulation (game-playing), discussed in an earlier part of this section of this Report, is one strategy for bringing concepts into a life perspective so that they are not only learned, but experienced. Simulation allows one to act "as if" he were actually engaged in a given situation (discontinuity), with much of the real exploring, crystallizing, etc. activity in the anticipatory mode, but with none of the irreversibility characteristic of accommodation to a real role which he has elected to assume. In the initial phases of becoming adept at decision-making, simulation provides a stimulating but safe setting for experience in sifting facts/data, selectively focusing on preferred alternatives, and decreasing the range of possibilities while increasing commitment to those remaining. In a well-designed simulation, mistakes are highly visible as outcomes are generated from self-determined inputs, and one compares the expected results with the (hypothetical) reality of the simulated outcome. In a simulation then, one has the opportunity to re-cycle through his process, correcting mistakes without bearing the ultimate responsibility of living with his decisions.

Simulation raises the inquirer one step above the relatively static mode of concept learning divorced from experience. It provides the inquirer with an opportunity to test out these concepts in a life-like situation, gaining practice in their implementation, insight into his idiosyncratic decision-making style, and, hopefully, confidence in his ability to process information, organize and select from alternatives, and achieve personally satisfying outcomes. It does, however, exclude one critical aspect of decision-making which is perhaps preferably absent at first, but increasingly necessary for growth to occur in the mastery of decision-making skills and their transfer to real experience. This aspect is the peculiar mixture of joy and pain which characterizes the recognition that a particular decision is "for keeps", and which Tiedeman and O'Hara have documented in their description of the three stages of their decision-making paradigm subsumed under the mode of "accommodation".

In order for the ISVD to justify its existence and attain its objectives, it needs to provide inquirers with the opportunity to use its resources in applying decision-making skills to real as well as hypothetical discontinuities, creating a setting in which they may master *all* the stages of the paradigm. In so doing, it further needs to provide a MONITOR which will keep track not only of the inquirer's progress through the System (as a manifestation of the paradigm), but also of the extent to which his mastery of and in the System is transferred to external situations. Finally, it needs to provide opportunities for the transfer and internalization of this

"Monitoring" capacity from the System to the inquirer, so that he may come to the realization of self-sufficiency and responsibility for career.

The recognition of this need for monitoring of experience in real as well as hypothetical deciding led to a new emphasis during the project's second year on what came to be called "secondary data files". These files are planned to consist of a) each inquirer's educational and psychological characteristics, analogous to what might be the contents of his folder in a guidance office; and b) distillations of his experience in decision-making in both simulated and real modes, within and outside of the System. They are organized to exist in a progressively shifting relationship to the system's "primary data files" (Occupational, Educational, Military, and Family Living), whereby secondary files play an increasing role in the inquirer's interaction with the System, simultaneously growing in size as indications regarding personal characteristics (attributes and accomplishments) become more numerous and as the inquirer engages in more experiences in decision-making behavior and shares them with the System. The first secondary file, containing data about the individual which he may use in either simulating decisions or as inputs to statistical procedures yielding projections of outcomes for real or hypothetical decisions, has been labeled the "Personal Inquirer Characteristics Data File". The second file, in which are stored abstracts from the inquirer's experience in decision-making, is called the "Decisional Frameworks Data File". These latter data will be largely in the form of "summary statements" which the inquirer periodically offers as he cycles repeatedly through the sequence of REVIEW, EXPLORATION, and CLARIFICATION with respect to particular discontinuities. These summary statements, or abstractions of life experience, may be made in a mode of either anticipation or accommodation; on the one hand looking forward to a hypothesized outcome of a particular decision, and on the other reflecting on the actual experience of living with the decision.

While the Decisional Frameworks Data File is planned to accept as inputs summary statements from all three access routines, for

Prototype I major efforts have been given to making it operational just for REVIEW. Other applications have already been suggested, such as eliciting summary statements regarding external clarifications of alternatives. These, however, will have to be part of Prototype II. Access Routine REVIEW, in its most elemental form, will involve the inquirer in a comparison of summary statements elicited in both of the above modes, relating to a single discontinuity. Such a comparison necessitates the storage and retrieval of the abstractions which the inquirer has made from experience in two dissimilar but functionally related life situations, i.e., his expectations and realized outcomes of a particular decision.

Because of the idiosyncratic nature of these data, which may be considered part of esoteric information systems existing within the larger ISVD, the inquirer needs to create a unique set of accessing procedures which will allow him freedom of movement comparable to that which he enjoys with respect to primary data files. If personally created data are to be used productively, with minimum loss of meaning to their user, then the organizational scheme applied to them should also reflect their unique quality. For this to occur, the inquirer needs to share responsibility with the System not only for the creation of data, but also for their accessing. Summary statements, as linguistic representations of experience, are by their very nature a distortoin of that experience. Further abstraction from these representations without direct reference to the inquirer as repository of the experience, e.g., by indexing according to a pre-ordained, extra-individual classification scheme, magnifies the distortion and can render the data meaningless. The inquirer thus needs to create appropriate indexing terms (with System assistance) which satisfy both processing and experiential criteria. Satisfaction of these criteria provide the setting in which data pertaining to personal experience can become relevant information regarding personal decision-making frameworks, thus facilitating the growth of agency in deciding. Collaboration of inquirer with System in abstracting and synthesizing experience, with ultimate responsibility for accuracy resting with the inquirer, makes him in a very real sense the doer and observer of what is done.

Access routine REVIEW is planned to accommodate these aims of data-collection and information-generation. Initially (for Prototype I) REVIEW will provide inquirers with the opportunity to input data about discontinuities in the form of summary statements in the modes discussed above. It will also enable inquirers to engage in supervised practice in the creation of idiosyncratic accessing procedures for these data, thus facilitating later retrieval and examination of data by the inquirer according to personally determined classification schemes. After input of a summary statement, the inquirer is requested to create and apply to this set of data a "map" of higher-order concepts (index terms) which serve to abstract the statement with a minimum loss of meaning to him. At the same time, the System engages in its own mapping of the statement, reducing it to a set of logically and linguistically consistent terms. The inquirer is then asked to compare these two renderings of his statement, and create a unity of the logically (System) and experientially (self) determined sets of terms. This synthesis, as expressed in the inquirer's own terms, then becomes the indexing procedure by which the summary statement is filed. In processing later statements, the inquirer may wish to examine his previous sets of index terms, or he may also have access to the rules governing the linguistic procedures which provide the System mapping of his statement. By repetitive interaction with the summary statement routine, the inquirer accumulates a growing file of data pertaining to his actual decisions, as well as a thesaurus of conceptual terms which serve to organize these data within his Decisional Frameworks File and which make sense to him.

For Prototype I, access routine REVIEW and associated language processing techniques will be limited to the discontinuity of academic program selection for the tenth grade. Interactive scripts for eliciting, mapping, and synthesizing statements by inquirer have been written, and language processing routines are in progress. One hundred fifty summary statements have been obtained from students in grade nine who were asked to anticipate the outcomes of their decisions to enroll in certain courses for grade ten. These statements were analyzed for the presence of specific dimensions, such as grade expected, relatedness to future plans, etc., yielding a tentative list of approximately thirty content categories. The statements were then submitted to Key-Word-in-Context (KWIC) procedures, which provided an alphabetic listing of every word in the sample of statements together with its surrounding context. Individual words and phrases in this listing were then assigned to the categories, creating a set of lists of words and phrases (entries) which are felt to convey equivalent meanings within each list. These lists, when inserted into a specially designed TRAC/ELIZA program, will provide a natural language dictionary to perform System mapping of summary statements regarding this particular discontinuity. The field testing of the dictionary will yield important feedback for its revision and up-dating, and also provide a model for the operation of future dictionaries constructed in relation to other access routines and discontinuities.

During the coming year, in preparation for Prototype II and specifications for Prototype III, we will engage in generalizing these routines in several directions as follows.

First, in order to create a meaningful set of data regarding decisional frameworks for any inquirer, we need to offer the capability to engage the summary statement routine for a number of discontinuities. While the processing routines are highly modular in this respect, mapping of statements regarding different discontinuities requires different dictionaries analogous to the one created for tenth grade course selection. For the immediate future, we will concentrate on building several additional dictionaries tailored to inter-related discontinuities so that we can provide a Decisional Frameworks Data File facilitating continuity across specific decision points. While our eventual hope is to be able to construct fewer, more generally applicable dictionaries of career development, the most effective strategy initially would seem to be the creation of some discontinuity-specific dictionaries which later may be examined for the presence of commonalities. "Omnibus" dictionaries, if practical at all, will grow out of these limited attempts. "Omnibus" dictionaries will not themselves provide the start we need.

In this vein, we will be taking a second look at our first dictionary, to test for the existence of higher-order constructs reflected in combinations of the present categories. The specifications of first-order categories on the most concrete level reduces the "cognitive dissonance" of inquirers when first confronted with a linguistic mapping of their statements, and allows for later re-combination of elemental categories into higher-order constructs. While this effort is still embryonic, so that specific examples do not yet exist, it seems not unreasonable to expect that such theoretical constructs as the elements of the Tiedeman-O'Hara paradigm might be manifest in the presence, absence, sequence, and/or emphasis of certain categories of meaning as "building blocks" within summary statements. Although the realization of this goal to any practicable degree within the life of the present project cannot at this time be predicted with any certainly, some guidelines and hypotheses should arise out of our field testing and future specifications.

At the same time that summary statement routines are made more applicable across discontinuities within the context of access routine REVIEW, we will also be exploring linkages between the Decisional Frameworks Data File and the other access routines of EXPLORATION and CLARIFICATION. This effort again requires the construction of additional dictionaries, plus script-writing to provide entry into the summary statement routines at certain points. Some possible applications of this inquirer-determined input would concern: exploratory or clarifying activities occurring outside of the System; reactions to specific scripts or interactions within the System; or other types of experiences in which meaning needs to be conveyed in the inquirer's own words.

Another important inter-relationship concerns the Decisional Frameworks Data File, incorporated largely in REVIEW, and other uses of subsidiary files. Linkages with the summary statement routines seem most likely for O'Mahoney's "Personal Dimensions" picture technique, a predominantly exploratory activity, and Hutchinson's "Value Heuristics" statistical procedure, whose major thrust seems to be primarily in clarification of desires and capabilities. The relevance of natural language processing as developed for decisional frameworks to these related strategies will be explored as we gear for Prototype II.

Computer Control for Processing of *Secondary* Data

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Summary

ISVD is organized so that design of the computer and guidance systems proceeds apace, but interactively, to the extent that interaction can be arranged and maintained. In this regard the computer area originally offered the guidance area the computer capability planned as MINORCA. The guidance personnel accepted this design and worked within it during the Fifth and Sixth Quarters. During this time it became apparent that the capability originally planned for MINORCA needed augmentation by some of the capability inherent in ELIZA.

The procedural modification required by the incorporation of some ELIZA-like function in MINORCA has already been described in an earlier sub-section entitled "Computer Control for Presentation of *Primary* Data." Also, the experiments leading to orientation scripts in ELIZA are reported in sub-section B.2.b. above.

The primary focus of these existing scripts is toward both orientation and Access Routines, where the need for natural language processing seems paramount. The success of this exploration suggests that the replacement of the MINORCA action statement by a modified ELIZA may, indeed, be a reasonable hope.

The theory of ISVD requires that this reasonable hope actually be realized if at all possible. Recently a visitor to ISVD attempted the ELIZA orientation scripts. Upon reflection he said, "The System is not really responding to me." This statement represents both the dialectic within which *we* work to improve the System and the theoretical imperative which ISVD helps *a person* to realize and accept psychologically. The dialectic will be responded to during field test and revision of Prototypes I and II in our efforts to make the System ever more capable of personal-like responses. However, as noted in the second part of Section II, the fact of the matter is that personal-like statements will *never* fully be possible in any mechanical system. Therefore ISVD uses this foregone conclusion to interact with inquirers in a system, *seemingly* antithetical to it, 1) to teach them how to do things which can be done mechanically, 2) to let them do things in their career development with mechanical and personal help, and 3) to encourage them to rejoice in ultimate realization of the truth that life is theirs, not that of any mechanics.

ELIZA-like computer capability contributes to this theory in important ways. In the first place ELIZA-like computer capability permits programming in which a person may pass to parts of the System beyond those where he now works simply by mentioning right words *which do not have to be told to him beforehand.* In this regard, ELIZA gives the illusion that it is completely responsive to the inquirer's thoughts and needs. However, as the inquirer experiences the realization that ELIZA does not completely respond to him, he will then be helped by being taught what ELIZA actually *is* responding to. He will also in some regards be empowered to write and use personal programs in ELIZA-like forms. This activity will aid the inquirer to internalize the illusion of free response in a mechanistic environment. The experience, the practice, and aid at generalization by counselor and job supervisor will then help to complete the process by bringing a person to live the differentiated mechanical circumstance of the illusion without attributing power to it which is not the power of his own thought and action.

Counseling and Supervision in the ISVD and Required Re-Organization and Re-Education

Professional Personnel

Sara Booth, Duncan Circle, Russell Davis, Gordon Dudley, Richard Durstine, Wallace Fletcher, Edward Landy, Lawrence Lerer, Priscilla Little, Robert O'Hara, David Tiedman, Eugene Wilson, and Michael Wilson

Summary

The overall plan for both providing counseling and supervision in the ISVD and for facilitating the required re-organization and re-education was reported in separate sections in the First Annual Report and its two subsequent Quarterly Reports. Those two subsections are presently combined in this Report in order to demonstrate more of the coordination and direction which is involved in attempting to create a critical mass by the expiration of the present ISVD grant which will be sufficient in size to pick up and sustain the momentum which we have created with help of resource from the U.S. Office of Education. The following general phases are presently conceived as inherent in these coordinate activities:

	A. *Re-organization of Counseling and Supervision*	B. *Re-education and Revision of Support*
June 1966—June 1969	A.1. Establish relationships with NEEDS, Newton, WEMBROC, and other institutions required for resources, data, and field testing of Prototype II	B.1. Issue reports as they become available. Engage in professional activity designed to bring resources into the ISVD and to ready counselors and vocational educators for the ISVD
March 1967—June 1969	A.2. Establish and help to maintain the extra support activities required in NEEDS, Newton, and WEMBROC for a try out of Prototype I and field testing of Prototype II	B.2. Incorporate graduate students into ISVD to prepare them for subsequent use of ISVD
January 1966—February 1968	A.3. Plan for MONITOR and supervision. Mount rudimentary MONITOR for Prototype I	
March—June 1968	A.4. Implement 3 for Prototype I	
July—August 1968	A.5. Do restricted field testing of Prototype I to develop specification modifications for Prototype II. Expand MONITOR as much as possible	
September—December 1968	A.6. Implement 5 above as Prototype II. Prepare directions for supervision during field test and train needed support personnel	
January—May 1969	A.7. Field test Prototype II	B.3. Conduct institutes for persons who are likely to become users of ISVD

Re-Organization of Counseling and Supervision

Phase A.1. is continuing as planned. Phase A.2. has taken the form of a Career Resources Center maintained in collaboration with the Newton School Department.

CAREER RESOURCES CENTER

The center has been physically moved to Newton High School and has been in operation there on a somewhat limited scale for two months. The response by the students has been very positive and it strongly indicates that students want and will use information when it is available for education and vocational decision-making. The Center includes the library and the Jobs for Youth information. The initial activities have included spending a week each in four different student lounges with an extensive display of free occupational literature and some audio-visual aids. More than 200 students had contact with the display in each of the locations. Many teachers also came and some brought their classes. Students followed up this initial contact by visiting the main Center where more information was available.

Resource speakers in different career fields have been asked to speak to groups of interested students. To date three of these programs have been held with more scheduled for the future.

Typical student requests for information have been recorded and distributed to ISVD script writers. Plans are proceeding to use the Career Center as a test site for Prototype II. College classes of Occupational Information from three different universities are scheduled to visit the center this next quarter. Already several counselors from vocational schools have spent considerable time at the Center inquiring about its development and organization.

Re-education and Revision of Support

RE-EDUCATION: PUBLICATION AND REPORT CIRCULATION

From time to time, the ISVD issues Technical Memoranda, Project Reports, and Working Papers. Technical memoranda are of the most enduring interest and are therefore printed. Project Reports are on matters timely to the theoretical and substantive development of the project. They are therefore multilithed or mimeographed. Working Papers are largely conceived as working papers for use of project personnel but are shared with a select list of persons who are also working in the area of the project. This latter group is also circulated with substantive staff memoranda as these are prepared.

Since the inception of the project, 3 Technical Memoranda and 15 Project Reports have been issued. Five of the Project Reports were issued during the current year. A complete list of titles in each of these series may be found in Section V.

Tiedeman and Dudley completed plans to enter into agreement with Dorsey Press for publication of a revised version of THOUGHT, CHOICE, AND ACTION: PROCESSES OF EXPLORATION AND COMMITMENT IN CAREER DEVELOPMENT.

Since inception of ISVD, we have maintained and circulated a mailing list with all ISVD publications. To date, this list numbers 218 individuals. Represented in this figure are persons in academic institutions and governmental agencies from 33 states and 9 foreign countries.

RE-EDUCATION: VISITORS

During the past year numerous individuals have visited the project's offices in order to talk with various members of the stff and learn more about ISVD.

Among these visitors were Miss Judy Weinstein and Dr. Clay Brittain, both of the U.S. Office of Education. Other visitors have been Mr. Jean Akl, Director of Vocational and Technical Education in the Ministry of Education in Lebanon; Mrs. Sylvia Goodson and Mrs. Polly Conway of the Atlanta, Georgia Public Schools; Mrs. Trudy Howard, free lance writer; Mr. Chester Maroin of the Famous Schools; Dr. Harold Skorpen, Associate in Higher Education of the New York State Department of Education; and Dr. Franklin P. Zeran of the Oregon State University School of Education.

RE-EDUCATION: DISCUSSIONS AND SPEECHES

Tiedeman, Kroll, Segal, and E. Wilson were involved in the 1967

Institute for Administrators of Pupil Personnel Services, an annual two week invitational conference of the Harvard Graduate School of Education. A number of potentially useful contacts were made, such as a request for materials and consultation from the Maryland State Department of Education where a committee has been organized to plan a state-wide computerized educational system.

Ellis and Tiedeman have had conversations with persons from Medinet. Medinet has an operative demonstration of many of the types of operations which ISVD will construct in the realm of self development by the encouragement of awareness of decision during life. Therefore, there may well be opportunity for ISVD to benefit from some of the experience of this pioneer Medinet project.

Fletcher and Lerer are consulting on the career development center being planned at University City Science Center, Philadelphia. Both have been consulted in relation to the final report on this project which is entitled, "Career Development."

Ellis, O'Hara, and Tiedeman attended a September 1967 meeting of the Invitational Symposium for Systems Under Development for Vocational Guidance, hosted by IBM at Yorktown Heights, New York.

Ellis, Fletcher, O'Hara, and Tiedeman have been in contact with several persons in the General Learning Corporation. The General Learning Corporation has loaned Roy Forbes to the ISVD on a half-time basis. Forbes adds to the programming resource available in ISVD. His presence also provides General Learning Corporation an opportunity to learn more about the ISVD and to construct plans for adaptation and potential use of the prototypes on its own bases.

Tiedeman, O'Hara, and Wilson presented a panel discussion on ISVD at the twenty-first annual convention of the New England Personnel and Guidance Conference. Circle, Durstine, Fletcher, Hutchinson, Kroll, O'Hara and Tiedeman attended the American Personnel and Guidance Association Convention in Detroit on April 8, 9, and 10. On April 9 several members of this group spoke: Durstine on "Development of Data Files for Student Interaction," Hutchinson on "Computer Programs in ISVD," O'Hara on "Curriculum Organization for Vocational Development," and Tiedeman on "Economic, Educational and Personal Implications of Implementing Computerized Guidance Information Systems."

On April 24 Durstine, Ellis, O'Hara and Tiedeman presented a panel discussion at the Harvard Graduate School of Education Faculty Colloquium.

Davis has discussed ISVD with the U.S. Mexican Education Relations Committee of Education and World Affairs, with Statistical Packages seminar of Harvard University, and with representatives of the Torcuato di Tella Institute of Buenos Aires, Argentina.

On January 23 and 24, Ellis spoke at the New England Education Assessment Project in Manchester, New Hampshire. On May 14 and 15 he attended a conference held at Northwestern University and sponsored by EDUCOM; and on April 25 he spoke at a symposium entitled "Innovation and Technology" held at the University of Massachusetts.

Fletcher spoke to the faculty and management of the Women's Job Corps center in Clinton, Iowa on the need for and the resources of an ISVD type information system within the structure of adult education for the disadvantaged. Also during the Sixth Quarter, he addressed a group of twenty-two Harvard Graduate School of Education doctoral students who are conducting a field study of technical vocational education in the Boston School System. In addition, during a visit to Washington he spoke with Dr. Haddon, Acting Director of Research and Planning for Job Corps and Dr. Philip Arnow, Director of Policy and Planning for the U.S. Department of Labor. Fletcher has also addressed and conferred with the Synthesis Group (Executive Committee) of the Arthur D. Little Company's study of technical vocational education in California.

On February 13, 1968 he addressed the Boston Metropolitan Area Planning Commission on the topic "ISVD As a Central

Component of Area Manpower Development Programs."

Lerer is consulting with Alexandria, Virginia School System. In this capacity he participated in a workshop devoted to technical-vocational education. He addressed the group on "Vocational Education-Philosophy and Process," and then served as a leader of the task force concerned with vocational education. One session was devoted to new trends in vocational education, including a summary of ISVD. During the Sixth Quarter he spoke at the National Convention of the Associated Electrical Distributors in White Silver Springs, West Virginia and was key note speaker at the Alexandria, Virginia Public Schools' Teacher Training Institute. During the Seventh Quarter he visited the University of Iowa in regard to the preparation of multimedia materials for incorporation in ISVD scripts. He also spoke at the convention of the American Association of School Administrators held in Atlantic City, New Jersey on "Forecast for Educational Data Processing" and at the Clinton, Iowa Job Corps Center on "A Prototype Computer-Based Information System." At the Reasearch and Development Center of General Electric in Schenectady, New York his topic was "Computer Based Education Programs—Pre and In Service Training Mechanisms."

O'Hara was invited to speak at the Guidance Workshop at Queens College on November 9, 1967. This was an effort to bring knowledge of ISVD to counselors and administrators in the New York area. On February 9, 1968 he spoke on "Ethical Considerations of Computer-Based Guidance Systems" at the annual convention of the American Educational Research Association. He also attended the Fourth Invitational Symposium of Systems under Development held in Palo Alto, California from March 7 through 10, 1968, and read a paper entitled "On the Use of Natural Language in the ISVD." On March 26, 1968 he again spoke at the Guidance Workshop at Queens College.

Tiedeman has been involved in planning for an Institute which Teachers College, Columbia and Harvard University were to have offered jointly for teacher education. Professors Roger Myers and Donald Super of Teachers College were prime movers in that plan. The plan is now stalled due to lack of needed financial support. In addition to this activity, Tiedeman has held several discussions with Frank Minor of IBM Advanced Systems Development Division in regard to exchange of materials. He also presented a progress report to the US Office of Education Program Officers' Meeting, Guidance and Personnel Services and attended a report conference of the Ohio State University Center, Invitational Symposium for Systems Under Development for Vocational Guidance. On February 16, 1968 he addressed a seminar of faculty and students at the School of Education, University of Massachusetts on the topic "Tought, Choice and Action." He spoke at the City University of New York, Division of Teacher Education lecture series on March 27, 1968.

E. Wilson has been serving as a consultant to a career guidance project in Rochester, New York, which involves the Rochester School District, the Eastman Kodak Company, and the United States Employment Service. Kodak has loaned us a computerized console developed by their training division.

Joint work has also been carried on in connection with an "Orientation to ISVD's script, and on a modification of the "Life Career Game." In addition to this activity Wilson has spoken to a colloquium involving the faculty and doctoral students of the Education Department of Clark University. He has also spoken to the Bedford, Massachusetts High School Associates and the Maryland Personnel and Guidance Association. On March 7, 1968 he spoke to a group of business education students at Salem State College.

RE-EDUCATION: STUDENTS

The ISVD deliberately tries to involve students from the Harvard Graduate School of Education and elsewhere. Students of the Graduate School of Education hold appointments as research associates or research assistants in the project. One student of the University of Leeds holds appointment as research assistant. Two students of Ellis Page at University of Connecticut work under Allan Ellis in ISVD and NESDEC.

Davis, Durstine, Ellis, Lerer, O'Hara, and Tiedeman are involved in the regular instruction at the Harvard Graduate School of Education. Each of these instructors makes use of the ISVD theory and resources in the interest of gaining its understanding and acceptance. Larer, O'Hara, and Tiedeman are particularly involved with students in guidance at Harvard. Lerer has instructed students in relation to script writing during the year. O'Hara conducted a seminar on research in career development. Tiedeman conducted a course on Measurement and Educational Decision-Making which he is reshaping in the curriculum of the Harvard Graduate School of Education. Ellis and O'Hara each lectured in that course.

At the present time, it appears that several beginning students at the Harvard Graduate School of Education are interested in learning more about the project and in possibly aiding in it as other students move on to other work.

RE-EDUCATION: PLANS

1. Ellis, O'Hara, and Tiedeman continue to be involved in plans for the Teachers College, Columbia-Harvard Institute for Counselor Educators which will be held at Teachers College later this year.
2. Tiedeman is working on a speech to be presented in August 1968 at the XVIth International Congress, International Association of Applied Psychologists.
3. Arrangements are currently being made for individual enrollment of script-writing students with Lerer during Summer 1968.
4. Plans are being made for a NESDEC-Harvard Invitational Conference to be entitled: Individual Personnel Services: The Establishment and Maturing. ISVD will be a part of the program of that Conference.
5. During this year a great deal of discussion concerning plans for continuation of ISVD has taken place. The discussion has involved the ISVD Executive Committee members, the Harvard Graduate School of Education, New England Educa-

tion Data Systems, General Learning Corporation, Education-Division of Radio Corporation of America and others.

At the present time, plans are being laid to seek two grants from the U.S. Office of Education. The grants will essentially divide the effort of the ISVD. One grant which is being sought is being developed by a new corporation in New York City. The new corporation will seek support for field work in New York involving parts of the ISVD which the directors of the project decide to use. Personnel in the ISVD will make themselves available to the new corporation if invited. The second grant which will be sought will be forwarded through the Harvard Graduate School of Education. This grant will seek support of a three year research effort which will expand through interviews and analyses the kind of work called for at the conclusion of an earlier sub-section entitled "Deciding and Agency Development and their Coordination through *Secondary* Data Files."

REVISION OF SUPPORT: RELEASE OF TECHNICAL MATERIALS

The ISVD has prepared and distributed Project Reports and Technical Memoranda from time to time. However, the project additionally generates technical materials which can be used by parties with the appropriate support technology such as a computer.

The ISVD grant from the U.S. Office of Education requires that all materials and products be in the public domain. The intention of the ISVD is also to create a critical mass within the life of its grant such that the energy of the created mass is sufficient to generate some forward momentum in the absence of a future grant. To this end, the executive committee of the project is determined to encourage experimentation with ISVD materials whenever the interest is expressed by other parties capable of making adequate use of the first generation of materials available under terms of the ISVD grant. The project is therefore now prepared to receive and honor requests from parties who are able to demonstrate that they have the technical equipment and supporting staff capable of using experimental materials but without effort to monopolize those materials and without great likelihood of claiming more for the materials than they can presently be said to produce.

REVISION OF SUPPORT: CARRYING ISVD AFIELD

Activities in this area have taken place in the form of discussions with individuals in four main areas: 1) governmental officials other than those from the U.S. Office of Education; 2) educational administrators at state and local level; 3) influential persons in the general public; and, 4) individuals involved in school system specifications.

During this present year the ISVD project has been outlined to Dr. Haddon, Acting Director of Research and Planning in the Job Corps; Dr. Philip Arnow, Director of Policy and Planning in the U.S. Department of Labor; Sister Francetta, Associate Director of the Women's Job Corps; and Dr. Gerald Bush, Special Assistant to the U.S. Secretary of Labor.

Activity on the state and local level has been mostly concentrated in the Massachusetts area and has included administrators from such Boston area school systems as Newton, Brookline, Lexington and the five town Greater Lowell region. Within this activity, doctoral students in the educational administration program at the Harvard Graduate School of Education have been addressed twice. It is felt that the impact of men such as these, who are to be employed at the assistant superintendent and superintendent level in local school systems throughout the country, will be considerable.

In the area of influential individuals from the general public, Fletcher has worked with the Greater Boston Metropolitan Area Planning Commission. In addition, discussions have been held with key members of the National Chamber of Commerce and with the Massachusetts Chamber of Commerce sponsored National Alliance of Businessmen.

The Harvard Task Force on the creation of the designs of schools in the City of Boston has included a 5000 pupil campus type high school, a post-secondary business school and a technical-vocational facility. In all of these, specifications have been included to provide both space and program for an ISVD type capability. Additionally, work has been started with the Greater Lowell Technical-Vocational School Board and it is hoped that similar specifications will be included within their final design. Discussions are also being held with consultants on the Washington Technical Institute to this same end.

It is becoming apparent that the existence of the technology and theory of ISVD type programming is almost a mandate for its use. When key individuals, responsible in their communities for the creation of adequate educational facilities, are informed of ISVD potential they rapidly accept both the philosophy and the need for such programming.

Study and Assessment of the System

Professional Personnel

David Tiedeman, Director; Duncan Circle, Allan Ellis, Russell Davis, Richard Durstine, Wallace Fletcher, Edward Landy, Lawrence Lerer, Robert O'Hara, E. Wilson, and M. Wilson.

Summary

The overall plan for study and assessment of the ISVD consists of the following general phases:

June 1966—June 1968	1. Plan, construct, and implement Prototype I
July—August 1968	2. Do restricted field testing of Prototype I to develop specification modifications for Prototype II
September—December 1968	3. Implement Prototype II
January—May 1969	4. Do general field testing of Prototype II
June 1969	5. Prepare final report. Write specifications for Prototype III. Deliver Prototype II and specifications for Prototype III

We are still in Phase 1 of the above plan. Only two field tests have so far been initiated: one is by E. Wilson to test the decision-making booklet used with junior high school pupils in Newton; the other is by Lerer to assess changes in attitudes of pupils associated with the work-study program at Newton. Neither of these studies is yet completed.

EVALUATION OF CURRICULUM UNIT ON DECISION-MAKING

During the Fourth Quarter a curriculum unit was developed for use with ninth grade students at Bigelow Junior High School. Built around the booklet, "You, the Decider," it was designed for evaluation with pre- and post-testing on a revised Gribbons Readiness for Vocational Planning and utilized an adaptation of "O'Hara's Self-rating of Abilities, Interests, and Values. It was not possible to analyze these instruments until the Sixth Quarter due to other Fifth Quarter responsibilities. The results of the evaluation of these tests, promised as a Technical Memorandum in the Sixth Quarter, remain to be published. It is hoped that this can be accomplished in the Ninth Quarter.

EVALUATION OF NEWTON WORK-STUDY PROGRAM

During the present year Lerer completed a working paper evaluating the work-study program implemented in Newton during the previous year. Relating the theoretical premises under-girding ISVD to the concept of laboratory/experience learning made, a summary of the responses of a sample of twenty-seven work-study participants was prepared. Although the Newton work-study program appears not to have produced the results expected, there are many clear indications from the data that certain aspects of sense of agency are attainable with work-study pupils.

Activities: Administration of the Project

Professional Personnel

Sara Booth, Robert O'Hara, David Tiedeman, Eugene Wilson, and Michael Wilson

BUDGET

During the Sixth Quarter negotiation took place with the U.S. Office of Education Bureau of Research regarding our proposed budget for fiscal year 1 December 1967 through 30 November 1968. In January 1968 a contract amendment extended the period of our grant funding through 30 November 1968. In addition, a request for supplemental funds to enable ISVD to prepare materials appropriate for use with a disadvantaged population was approved.

COMPUTER LEASE

During the Fifth Quarter the Executive Committee voted to recommend to the Dean of the Harvard Graduate School of Education that he enter into an agreement with the New England Education Data Systems to lease prime time on thier RCA Spectra 70/45 computer and support consoles. A lease of four hours of computer time per day was negotiated and took effect on 15 December 1967.

PERSONNEL

In accordance with University policy we undertook during the Eighth Quarter a review and evaluation of our future needs in relation to personnel. Appointments for the coming academic year which coincides with the final period of the project, running until June 30, 1969, have also been submitted to the Dean's Office for approval.

This fund year of the project is a critical time for personnel. We have invested considerable funds in their education and training. Many of them are under pressure from outside sources to accept positions on projects similar to ISVD. University schedules regarding salaries and appointments are such that we cannot truly compete in the market place with commercial firms. Thus, we are at a distinct disadvantage in our efforts to hold the personnel we have trained. Any significant loss of personnel would be a blow to our efforts. Such a loss would result in a diminution of the quality and quantity of our project, since we are unable in the short time left to us, to train people to the level of those who might leave.

IV. Authority and Personnel of the Information System for Vocational Decisions

AUTHORITY OF THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

In liaison through the United States Office of Education

R. Louis Bright, Associate Commissioner of Research, Office of Education

Clay V. Brittain, Project Officer, Human Resources Branch, Division of Adult and Vocational Research

David E. Bushnell, Director, Division of Adult and Vocational Research

Eunice Jones, Project Officer, Human Resources Branch, Division of Adult and Vocational Research (through November, 1966)

Richard B. Otte, Project Officer, Human Resources Branch, Division of Adult and Vocational Research (Dec. 1966-Oct. 1967)

David Pollin, Deputy Associate U.S. Commissioner (Research)

Alice Y. Scates, Director, Human Resources Branch, Division of Adult and Vocational Research

Judith D. Weinstein, Research Assistant, Basic Studies Branch, Division of Comprehensive and Vocational Education Research

In liaison, Division of Vocational Education, Department of Education, Commonwealth of Massachusetts

Walter Markham, Director of Bureau of Vocational Education

John P. Morine, Member of Advisory Committee, and Senior Supervision, Occupational Information and Vocational Guidance

In liaison through the Office of the Dean, Harvard Graduate School of Education

Jane Batchelder, Administrative Assistant in charge of Personnel

Herman F. Eschenbacher, Member, *ex officio*, of Advisory Committee (resigned June 1967), Librarian, and Lecturer in Education
Dorothy A. Johnson, Administrative Assistant in the Office of the Dean
Edward G. Kaelber, Associate Dean (resigned February, 1968)
Paul A. Perry, Assistant Dean
Richard R. Rowe, Associate Dean (February, 1967—)
Theodore R. Sizer, Member, *ex officio*, Executive Committee, and Dean
Richard C. Wheeler, Associate Director of Placement

In liaison through the New England School Development Council—New England Education Data Systems

Raimond Bowles, Director of Finance, NESDEC-NEEDS
Richard Goodman, Executive Secretary, NESDEC-NEEDS; Chairman, Board of Directors, NEEDS
Hilton C. Holland, Chairman, Executive Committee, NESDEC
Michael J. Wilson, Executive Officer, NESDEC-NEEDS

Advisory Committee

†*E. Gil Boyer (resigned April, 1966), Administrator, NEEDS (June, 1963-June, 1966)
Charles T. W. Curle, Professor of Education and Development, Harvard Graduate School of Education
†*Russell G. Davis, Professor of Education and Development; Research Associate in Center for Studies in Education and Development, Harvard Graduate School of Education
Howard W. Dillon (appointed June, 1967), Acting Librarian, Harvard Graduate School of Education
†*Richard M. Durstine, Research Associate in Center for Studies in Education and Development; Lecturer in Education, Harvard Graduate School of Education
†*Allan B. Ellis, Director of Research, NEEDS; Assistant Professor of Education, Harvard Graduate School of Education
Herman F. Eschenbacher (resigned June, 1967), Librarian, Harvard Graduate School of Education (July, 1965-July 1967)
†*Wallace J. Fletcher, Research Associate, Harvard Graduate School of Education; President, Western Metropolitan Boston Regional Opportunity Council, Inc.

Thomas E. Kurtz (appointed June, 1967), Director, Kiewit Computation Center, Dartmouth College

†*Edward Landy, Assistant Superintendent of the Newton Public School System and Director of Pupil Personnel Services and Special Education, Newton Public School Department

Emmanuel G. Mesthene, Executive Director, University Program on Technology and Society, Harvard University

John D. Morine, Senior Supervisor, Occupational Information and Vocational Guidance, Division of Vocational Education, Department of Education, Commonwealth of Massachusetts

†*Robert P. O'Hara, Executive Director, Information System for Vocational Decisions

*Theodore R. Sizer, *ex officio;* Dean, Harvard Graduate School of Education

†*David V. Tiedeman, Chairman; Professor of Education, Harvard Graduate School of Education; Chairman, Executive Committee, Information System for Vocational Decisions

†*Michael J. Wilson, Executive Officer, New England Education Data Systems

Norman Zachary (resigned April, 1967), Director, Harvard Computing Center

† Principal Investigator
* Member of Executive Committee

Research Associates

Duncan F. Circle
David B. Clemens (resigned June, 1967)
Arthur M. Kroll (resigned June, 1967)
Lawrence Lerer
Noel F. McGinn (resigned January, 1967)
Stephen Purcell (Summer, 1967)
Eugene H. Wilson

Systems Specialists

David Brewster
Barbara Howley (resigned April, 1968)
Roy E. Norris, Jr.

Heather Scott
Ann W. Taylor

Programmers

Toby Boyd
Arlene Scherer

Counselors (Newton School) Department

Roger Brown
James Hartman
Dorothy Kunberger
James McDade
Archibald Stark

Supervisor and Principal (Newton School) Department

Robert Frost
Edward C. Martin
Richard W. Mechem

Script Writers

Jon H. Abrahamson (Summer, 1967)
Margaret Addis
Gerald Bazer (Summer, 1967)
Joseph Clancy (Summer, 1967)
Neil Curran (Summer, 1967)
Hope Danielson (Summer, 1967)
Sara Eddy (Summer, 1967)
Gail Gassen (Summer, 1967)
James Hartman (Summer, 1967)
Robert W. Hayes (Summer, 1967)
Patricia Kelley (Summer, 1967)
Frank Lambert (Summer, 1967)
Cecile P. LeClair (Summer, 1967)
Paul H. Linscott (Summer, 1967)
Peter A. Mackie (Summer, 1967)
Dorothy A. Mahoney (Summer, 1967)
James M. McGovern (Summer, 1967)
Linda McLean (Summer, 1967)

Carolyn Mellor (Summer, 1967)
William H. Moore, Jr. (Summer, 1967)
Vivian Parker (Summer, 1967)
Bruce Pelton (Summer, 1967)
Catherine Psyhogios (Summer, 1967)
Robert M. Rosenblatt (Summer, 1967)
Howard Schofield (Summer, 1967)
Anne Stamas (Summer, 1967)
Archibald Stark (Summer, 1967)
Nancy Swidler
Armine D. Thomason (Summer, 1967)
Joseph M. Utka (Summer, 1967)

Audio Visual Specialist

Elaine Fisher (May, 1968—)

Administrative Assistant

Sara S. Booth

Research Assistants and Technicians

Robert Aylmer, Jr.
Susan Baldwin (Oct., 1967- March, 1968)
Nancy Blackmun (Summer, 1966)
Christopher Davis (Summer, 1967)
Larry Dougherty (September, 1967—)
Gordon Dudley (resigned August, 1967)
Patrick F. Ferrone (Summer, 1966)
Lynne Fitzhugh
Myra Gannaway
Charles E. Gunnoe
Thomas E. Hutchinson
Diana J. Kronstadt
Priscilla A. Little
Sandra J. Morse (Summer, 1966)
Terence J. O'Mahoney
Margaret E. Pincus (resigned May, 1968)
Dana E. Quitslund (resigned December, 1968)
Charles Roehrig (May, 1968—)

Richard Roman
Johanna Seltzer (resigned June, 1967)
Stanley A. Schainker (resigned September, 1967)
Arnold Smith (February, 1968-June, 1968)
Dorothy S. Swithenbank
Thomas E. Swithenbank
Elizabeth Truesdell (October, 1967—)
Jo Weissman (June, 1968—)
Esther Wiedman
Charles S. Wetherell (resigned August, 1967)
Laurence Wolff (resigned October, 1967)
Patricia Yee (July, 1967—)
Barbara Zurer (resigned May, 1967)

Communications Technician

Richard F. Topping

Secretaries

Patricia Capen
Martha Drake
Dorothy Julia Emerson
Karen Guillette (resigned September, 1967)
Marietta Haley
Susan Hartman
Jacqueline Hargrove (resigned July, 1967)
Nadia Hurt (resigned February, 1967)
Sheila Leahy
Linda LeBlanc
Alvis Martinez
Jean MacQuiddy (resigned April, 1967)
Wendy Mahon (resigned June, 1968)
Felice A. Merritt (resigned September, 1967)
Deborah Richardson
Nona D. Strauss
Helen E. Topping

Clerks

Jayne Lyons (resigned June, 1967)

Annette B. Miller (resigned June, 1968)
Mary A. O'Doherty (resigned June, 1967)

Courier

James P. Dean

Consultants

Warren Gribbons, Regis College (Summer, 1965)
Chris Kehas, Claremont Graduate School (Summer, 1967)
Paul Lohnes, Project TALENT (Summer and fall, 1967)
Esther Matthews, University of Oregon (Summer, 1967)
Frank J. Minor (time contributed by International Business Machines Corp., Inc.)
Calvin Mooers, Rockford Research Institute, Inc. (Summer and fall, 1966)
George D. Pasquella, Film Consultant (May, 1968)
Stanley Segal, Teachers College, Columbia University (Summer, 1967)

Sub-Contractors

Abt Associates (Spring, 1967)
Computer Associates (Spring and summer, 1967)

Visiting Researchers

Fran Archambault, University of Connecticut
Roy Forbes, General Learning Corporation
John McManus, University of Connecticut
William Mittlestadt, Eastman Kodak Co.
Gary Stapleford, Sanders Associates
Selwyn Taylor, Sanders Associates
Keith Whitmore, Eastman Kodak Co.

VI. Appendices

Appendix I. Categories of Information from the 850 Titles File and from the D.O.T. Supplement

Appendix II. Summary of Data Files on Occupations and Military Service Presently in the I.S.V.D.

Appendix III. System Organization*

  Career Development Software System Design

  Access Routine Organization

  Data Files and Script Organization

Appendix IV. PERT Chart: Systems Software

Appendix V. Specifications for an Orientation-Guidance-Placement Suite in a New Technical-Vocational Facility for the City of Boston

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*The System Design included in Appendix III is tentative. It reflects the state of our thought as of May, 1968. The flow charts indicate some of the ways in which the System will be implemented.

No. 10—"A Tentative Career Development Curriculum and its Implications for the Patterning of Supervisory Responsibilities in the Information System for Vocational Decisions" by Wallace J. Fletcher, Lawrence Lerer, and Charles Gunnoe.

No. 11—"A Rudimentary Demonstration for the Information System for Vocational Decisions: Orientation, Guidance Scripts, Test of Occupational Knowledge, and a Script Writing Language" by Allan B. Ellis, Robert P. O'Hara, and David V. Tiedeman.

No. 12—"The Role of Decision-Making in Information Generation: An Emerging New Potential in Guidance" by David V. Tiedeman.

No. 13—"Economic, Educational, and Personal Implications of Implementing Computerized Guidance Information Systems" by David V. Tiedeman.

No. 14—"Getting a Guidance Machine to Understand English" by Allan B. Ellis, Margaret E. Pincus, and Patricia Yee.

No. 15—"Datafiles for Computerized Vocational Guidance: Requirements, Preparation, Use" by Richard M. Durstine.

In addition to the above publications, the following manuscript was prepared:

Thought, Choice and Action: Processes of Exploration and Commitment in Career Development by David V. Tiedeman and Gordon A. Dudley.

V. Publications

TECHNICAL MEMORANDA

No. 1—"The Computer and Career Decisions" by Allan B. Ellis and Charles S. Wetherell.

No. 2—"Forecasting for Computer Aided Career Decisions: Survey of Methodology" by Russell G. Davis.

No. 3—"Level of Aspiration and Models Applicable to the Problem of Choice of Career" by Thomas E. Huchinson.

PROJECT REPORTS

No. 1—"The Organization and Intention of a Proposed Data and Educational System for Vocational Decision-Making" by David V. Tiedeman.

No. 2—"An Information System for Vocational Decisions (ISVD): Cultivating the Possibility for Career through Operations" by David V. Tiedeman.

No. 3—"A Theoretical Foundation for the Use of Occupational Information in Guidance" by Robert P. O'Hara.

No. 4—"Suggestions for Treatment of Information about Occupations" by Richard M. Durstine.

No. 5—"Self Esteem Because of Collegiate Admission and Education" by David V. Tiedeman.

No. 6—"Forecasting for Computer Aided Decisions: Prospects and Procedures" by Richard M. Durstine.

No. 7—"A Task Oriented Course in Decision-Making" by Eugene H. Wilson.

No. 8—"Toward a Language of Supervision" by Wallace J. Fletcher, Lawrence Lerer, and Charles Gunnoe.

No. 9—"Recent Developments and Current Prospects in Occupational Fact Mediation" by David V. Tiedeman.

APPENDIX I

Categories of Information from the 850 Titles File and from the D.O.T. Supplement

Category	*In 850 Titles File*	*In D.O.T. Supplement*
1. Occupational title	yes	yes
2. Alternate titles	up to five	
3. Entry occupations	up to four	
4. Higher occupations	up to four	
5. Industries where found	up to four	one only
6. Brief verbal description	yes	
7. Worker trait sector (from D.O.T.)	yes	yes
8. Aptitudes: General intelligence	five levels	five levels
9. Aptitudes: Verbal ability	five levels	five levels
10. Aptitudes: Numerical ability	five levels	five levels
11. Aptitudes: Spatial perception	five levels	five levels
12. Aptitudes: Form perception	five levels	five levels
13. Aptitudes: Clerical perception	five levels	five levels
14. Aptitudes: Motor coordination	five levels	five levels
15. Aptitudes: Finger dexterity	five levels	five levels
16. Aptitudes: Manual dexterity	five levels	five levels
17. Aptitudes: Eye-Hand-Foot coordination	five levels	five levels
18. Aptitudes: Color discrimination	five levels	five levels
19. Interest preferences	up to three	
20. Occupational situations	up to three	up to five
21. Strength required	five levels	five levels
22. Physical demands	up to five	up to five
23. Required high school courses	36 possibilities	
24. Salaries and wages	three levels	
25. Required academic ability	four levels	
26. Required mechanical ability	four levels	
27. Required social intelligence	four levels	
28. Required clerical ability	four levels	
29. Required musical ability	four levels	
30. Required artistic ability	four levels	
31. Required physical ability	four levels	

32. Most common prior activity	up to two	
33. On-the-job training	eight levels	See item 63
34. Formal education required	eight levels	See item 62
35. Formal education preferred	eight levels	See item 62
36. Recommended school courses	up to four	
37. Short training courses	up to two	
38. Distribution of sexes	five levels	
39. Minimum age	yes	
40. License requirement	yes	
41. Union membership	yes	
42. Working conditions	up to six	up to six
43. Place of work (indoor, outdoor)	yes	yes
44. Weekend work	three levels	
45. Hours of work	three levels	
46. Requirements for travel	three levels	
47. Seasonality	yes	
48. Basis of income	four levels	
49. Incentives and fringe benefits	up to four	
50. Opportunities for promotion	four levels	
51. Paths for promotion	up to two	
52. Opportunities for mobility	four levels	
53. Possibility of self-employment	yes	
54. Growth rate of occupation	four levels	
55. Demand for workers	five levels	
56. Trend of wages	three levels	
57. Worker functions—data		ten levels
58. Worker functions—people		nine levels
59. Worker functions—things		eleven levels
60. Work fields		up to two
61. D.O.T. number	yes	old and new
62. General educational development	See items 34, 35	six levels
63. Specific vocational preparation	See item 33	nine levels
64. Materials, products, subject matter		up to two

NOTES:

There is some redundancy among the categories of the 850 Titles File that must be worked out in its use.

The two data files described here are merged into one for operation within the ISVD.

In all cases there is a possibility that "not applicable," "no information" or some similar null message can be coded as appropriate.

APPENDIX II

Summary of Data Files on Occupations and Military Service Presently in the ISVD

File Identification	*Number of Titles (approx.)*	*Number of Categories*	*Summary Description*
850 Occupational Titles	860	56	See Appendix I
DOT Supplement	13,800	27	See Appendix I
Roe Groups	800	2	Roe Category and Level
Forecasting	160	160	High and low estimates of employment by year, 1960-80, for six selected industries (out of 120 possible industries)
Military enlisted	170	varies by service	About ten categories for each service
Military Officers	Not applicable	Not applicable	This information is presented in script form
References	10,000	1	Provides link to library of occupational information at Newton High School

APPENDIX III

*System Organization**

Career Development Software System Design

Access Routine Organization

Data Files and Script Organization

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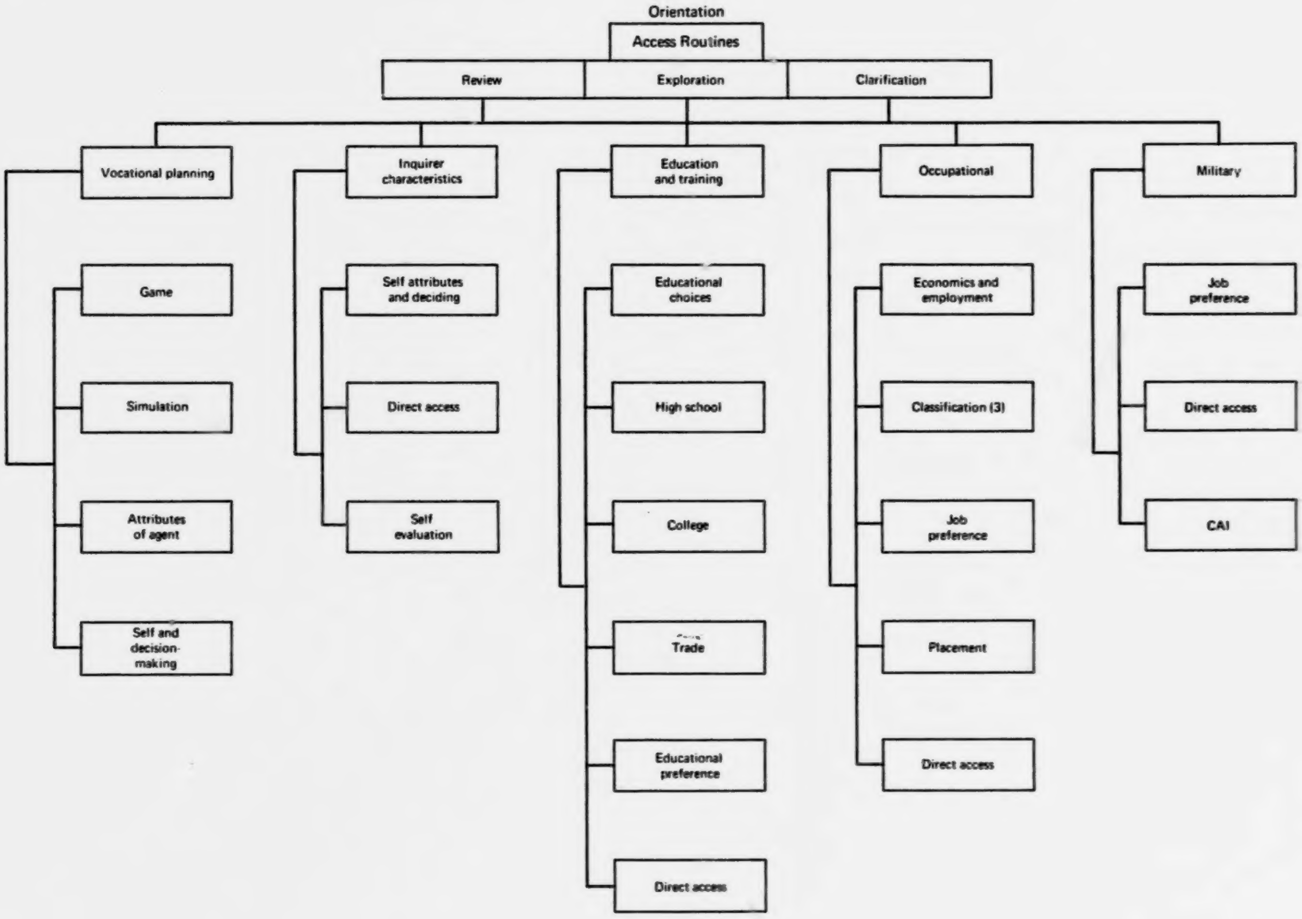
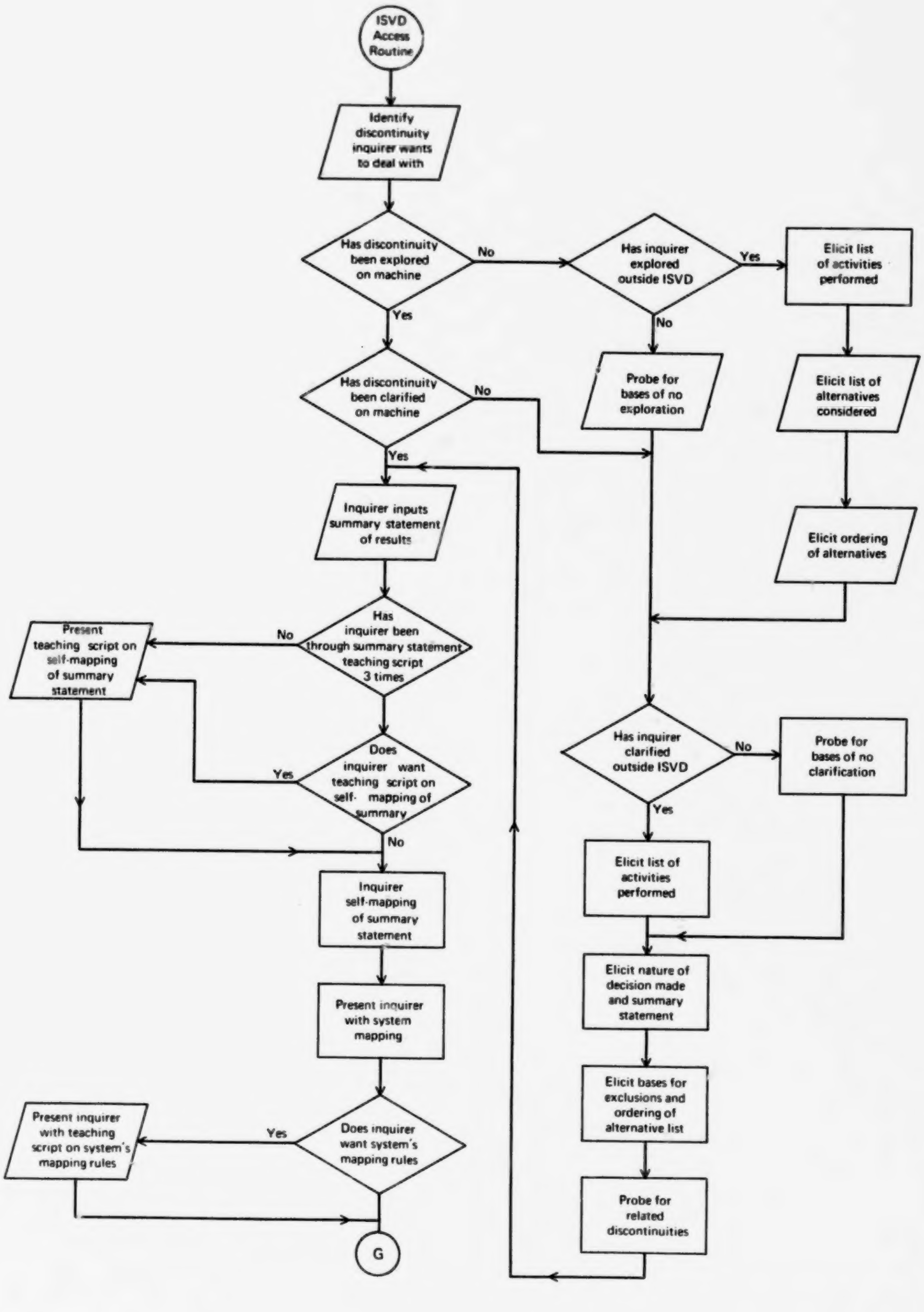
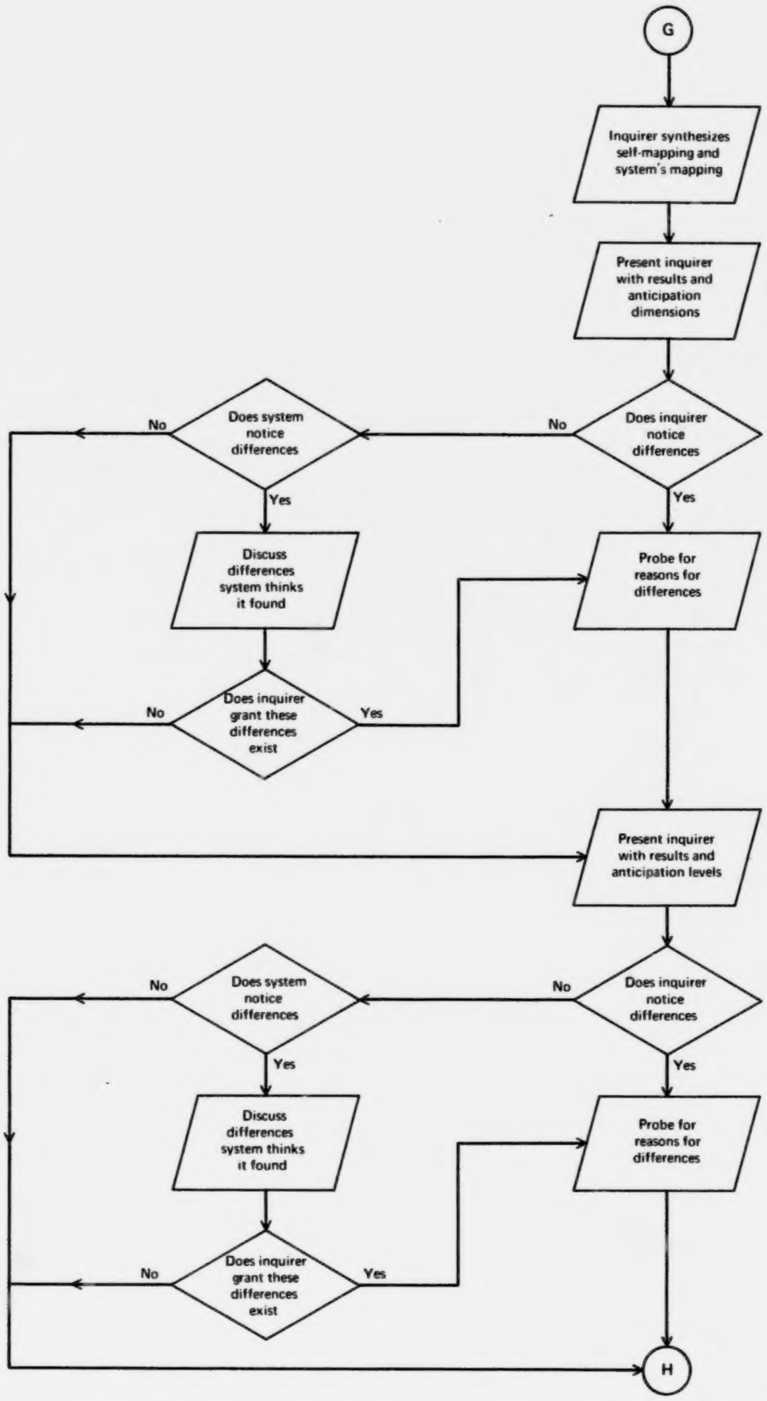
* The System Design included in Appendix III is tentative. It reflects the state of our thought as of May, 1968. The flow charts indicate some of the ways in which the System will be implemented.

Career Development Software System Design

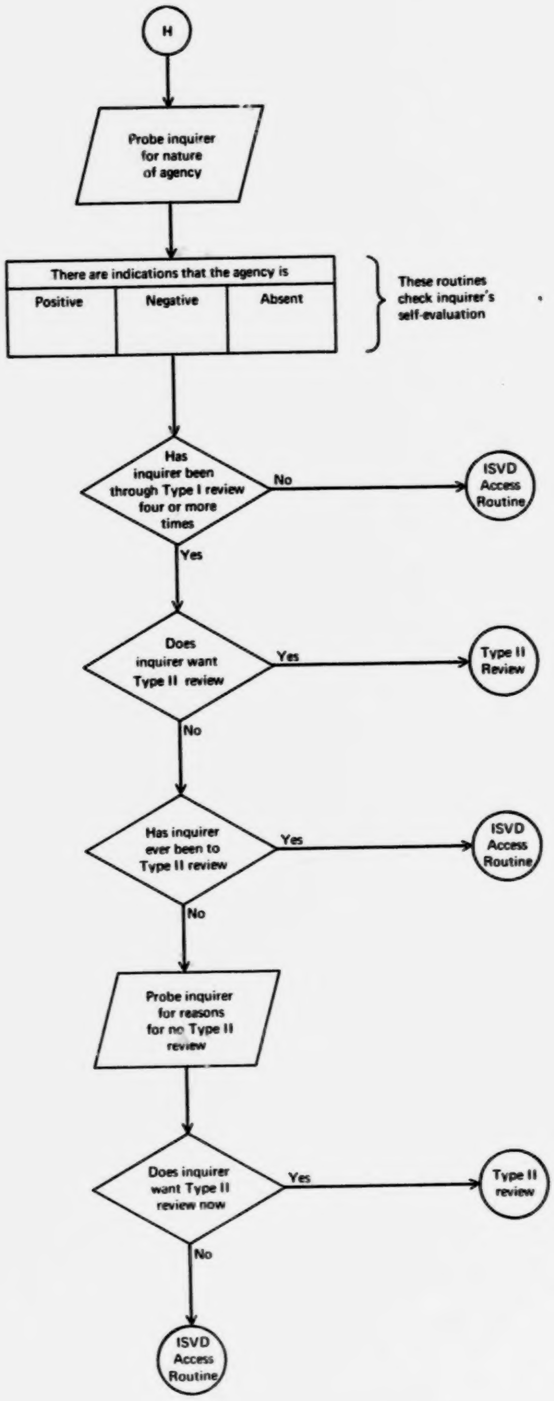

Orientation
Access Routines
Review
Exploration
Clarification
Vocational planning
Game
Simulation
Attributes of agent
Self and decision-making
Inquirer characteristics
Self attributes and deciding
Direct access
Self evaluation
Education and training
Educational choices
High school
College
Trade
Educational preference
Direct access
Occupational
Economics and employment
Classification (3)
Job preference
Placement
Direct access
Military
Job preference
Direct access
CAI


ISVD Access Routine
Identify discontinuity inquirer wants to deal with
Has discontinuity been explored on machine
No
Has inquirer explored outside ISVD
Yes
Elicit list of activities performed
Yes
No
Has discontinuity been clarified on machine
No
Probe for bases of no exploration
Elicit list of alternatives considered
Yes
Inquirer inputs summary statement of results
Elicit ordering of alternatives
Present teaching script on self-mapping of summary statement
No
Has inquirer been through summary statement teaching script 3 times
Does inquirer want teaching script on self- mapping of summary
Yes
Has inquirer clarified outside ISVD
No
Probe for bases of no clarification
Yes
No
Elicit list of activities performed
Inquirer self-mapping of summary statement
Elicit nature of decision made and summary statement
Present inquirer with system mapping
Elicit bases for exclusions and ordering of alternative list
Present inquirer with teaching script on system's mapping rules
Yes
Does inquirer want system's mapping rules
Probe for related discontinuities
G

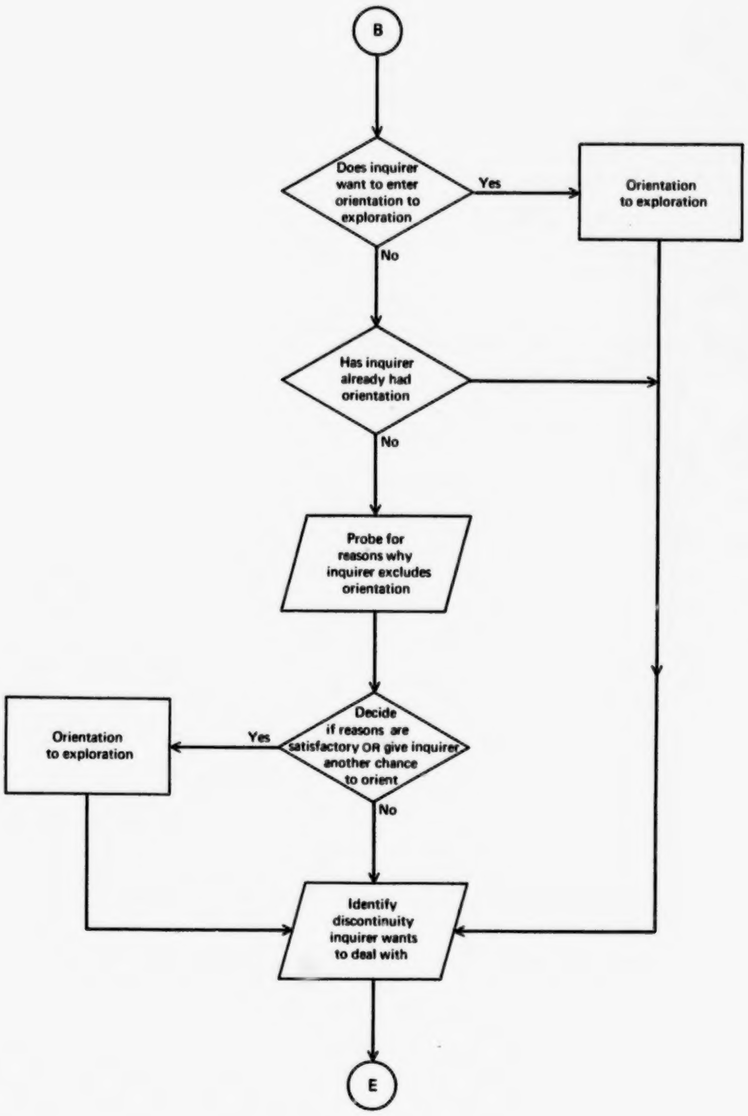
Review Access Routine (1)


G
Inquirer synthesizes self-mapping and system's mapping
Present inquirer with results and anticipation dimensions
Does inquirer notice differences
No
Yes
Does system notice differences
No
Yes
Discuss differences system thinks it found
Does inquirer grant these differences exist
No
Yes
Probe for reasons for differences
Present inquirer with results and anticipation levels
Does inquirer notice differences
No
Yes
Does system notice differences
No
Yes
Discuss differences system thinks it found
Does inquirer grant these differences exist
No
Yes
Probe for reasons for differences
H

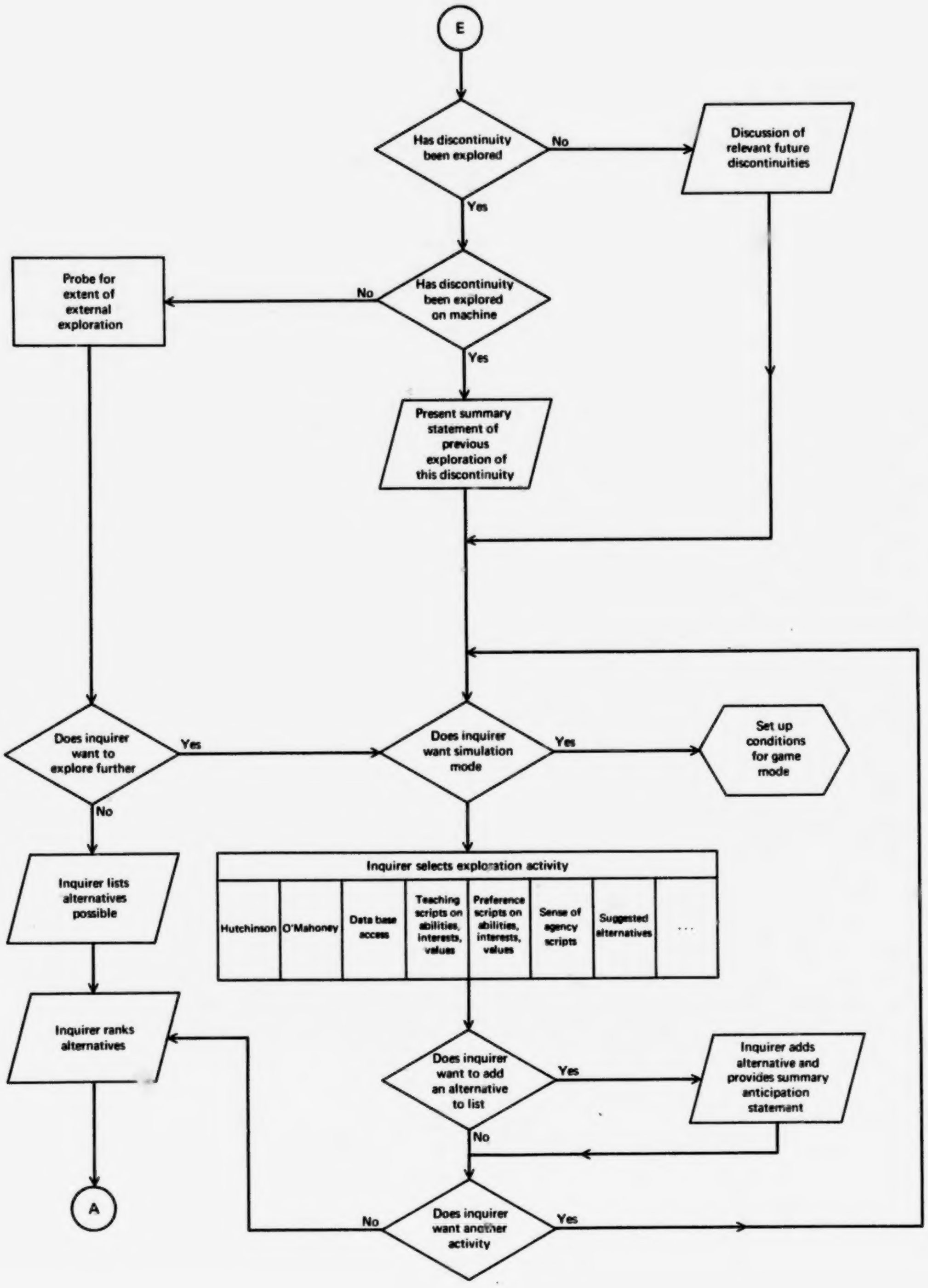
Review Access Routine (2)


H
Probe inquirer for nature of agency
There are indications that the agency is
Positive
Negative
Absent
These routines check inquirer's self-evaluation
Has inquirer been through Type I review four or more times
No
ISVD Access Routine
Yes
Does inquirer want Type II review
Yes
Type II Review
No
Has inquirer ever been to Type II review
Yes
ISVD Access Routine
No
Probe inquirer for reasons for no Type II review
Does inquirer want Type II review now
Yes
Type II review
No
ISVD Access Routine

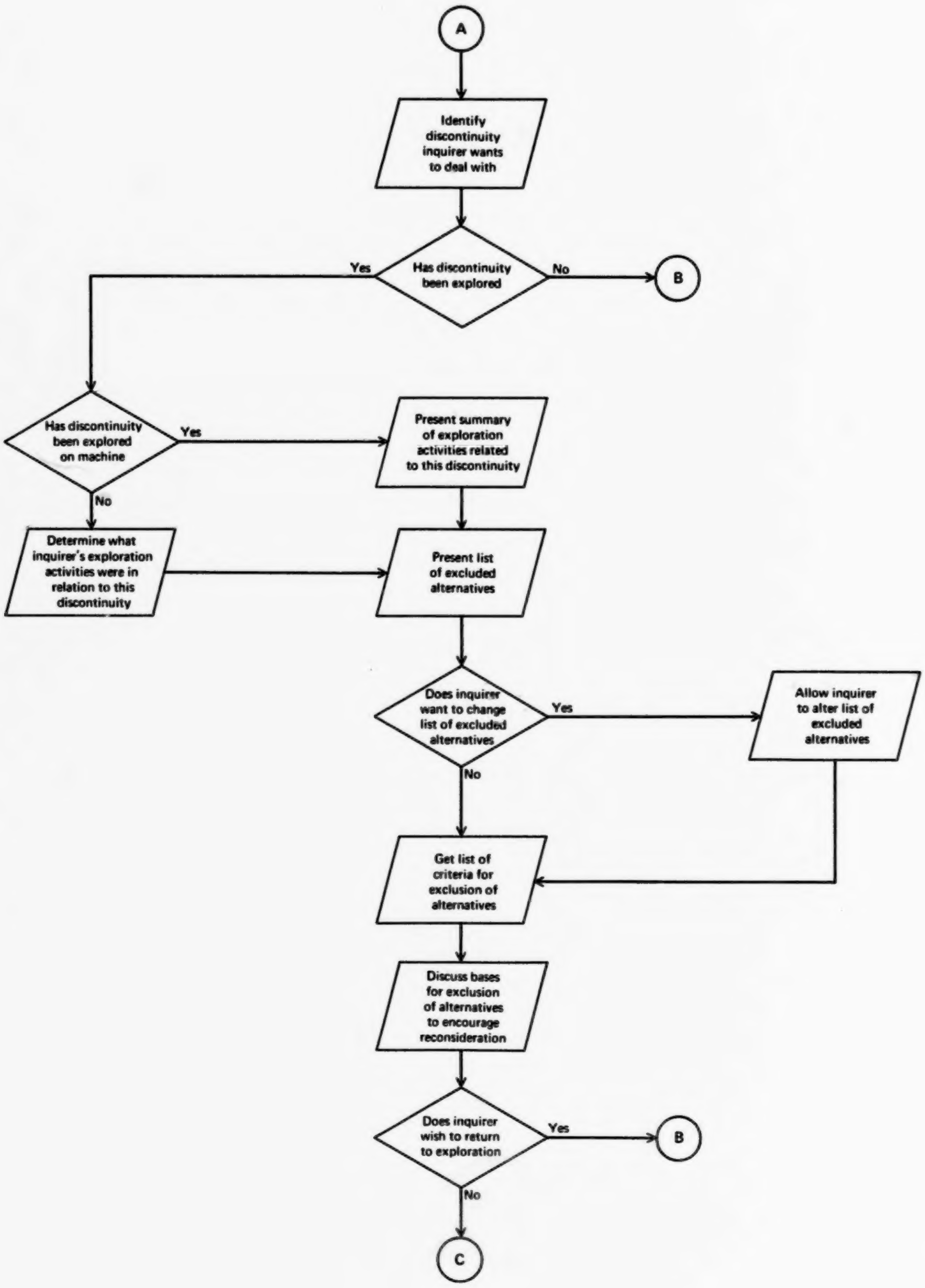
Review Access Routine (3)


B
Does inquirer want to enter orientation to exploration
Yes
Orientation to exploration
No
Has inquirer already had orientation
No
Probe for reasons why inquirer excludes orientation
Decide if reasons are satisfactory OR give inquirer another chance to orient
Yes
Orientation to exploration
No
Identify discontinuity inquirer wants to deal with
E

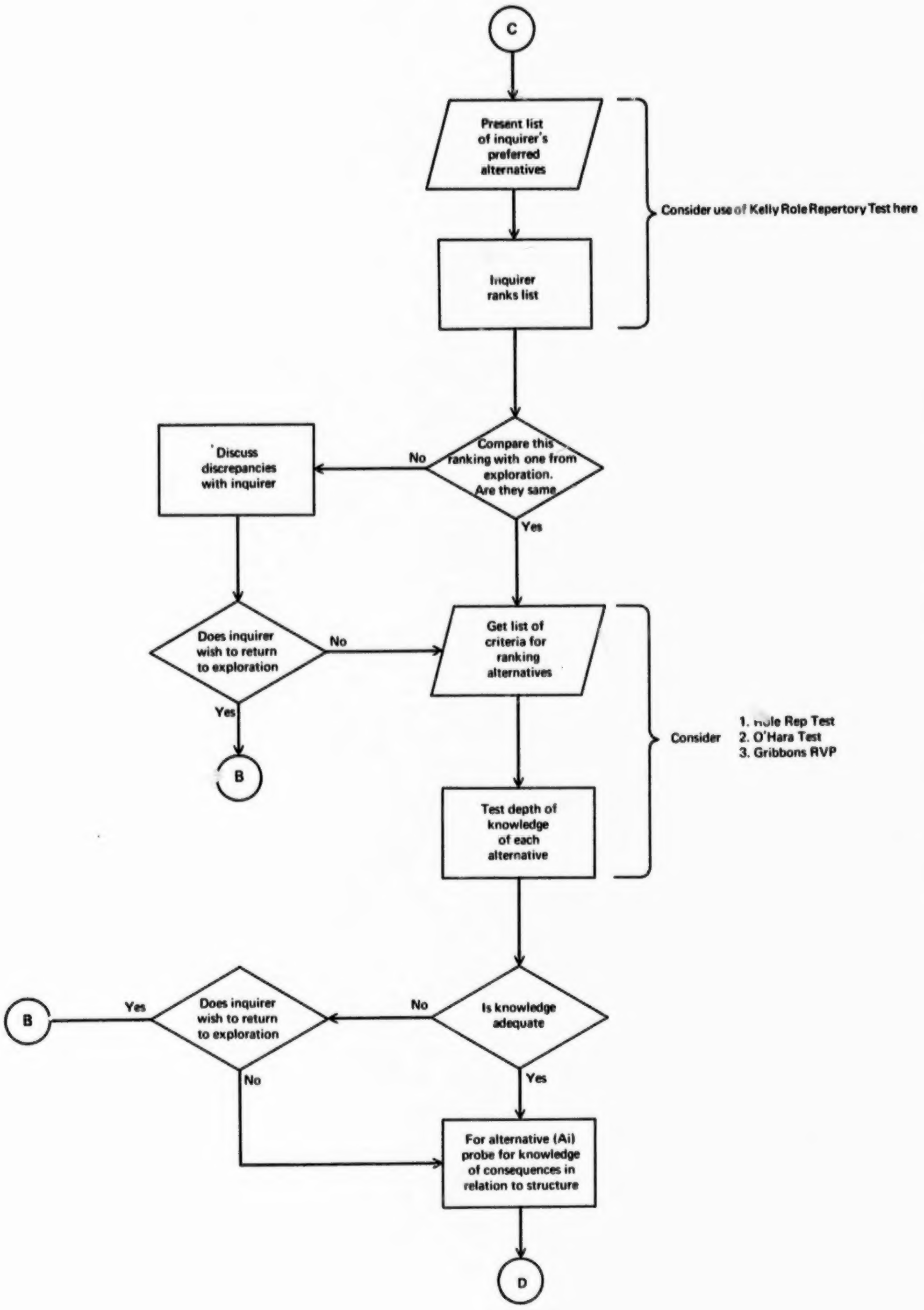
Exploration Access Routine (1)


E
Has discontinuity been explored
No
Discussion of relevant future discontinuities
Yes
Has discontinuity been explored on machine
No
Probe for extent of external exploration
Yes
Present summary statement of previous exploration of this discontinuity
Does inquirer want to explore further
Yes
Does inquirer want simulation mode
Yes
Set up conditions for game mode
No
Inquirer lists alternatives possible
Inquirer selects exploration activity
Hutchinson
O'Mahoney
Data base access
Teaching scripts on abilities, interests, values
Preference scripts on abilities, interests, values
Sense of agency scripts
Suggested alternatives
. . .
Inquirer ranks alternatives
Does inquirer want to add an alternative to list
Yes
Inquirer adds alternative and provides summary anticipation statement
No
A
No
Does inquirer want another activity
Yes

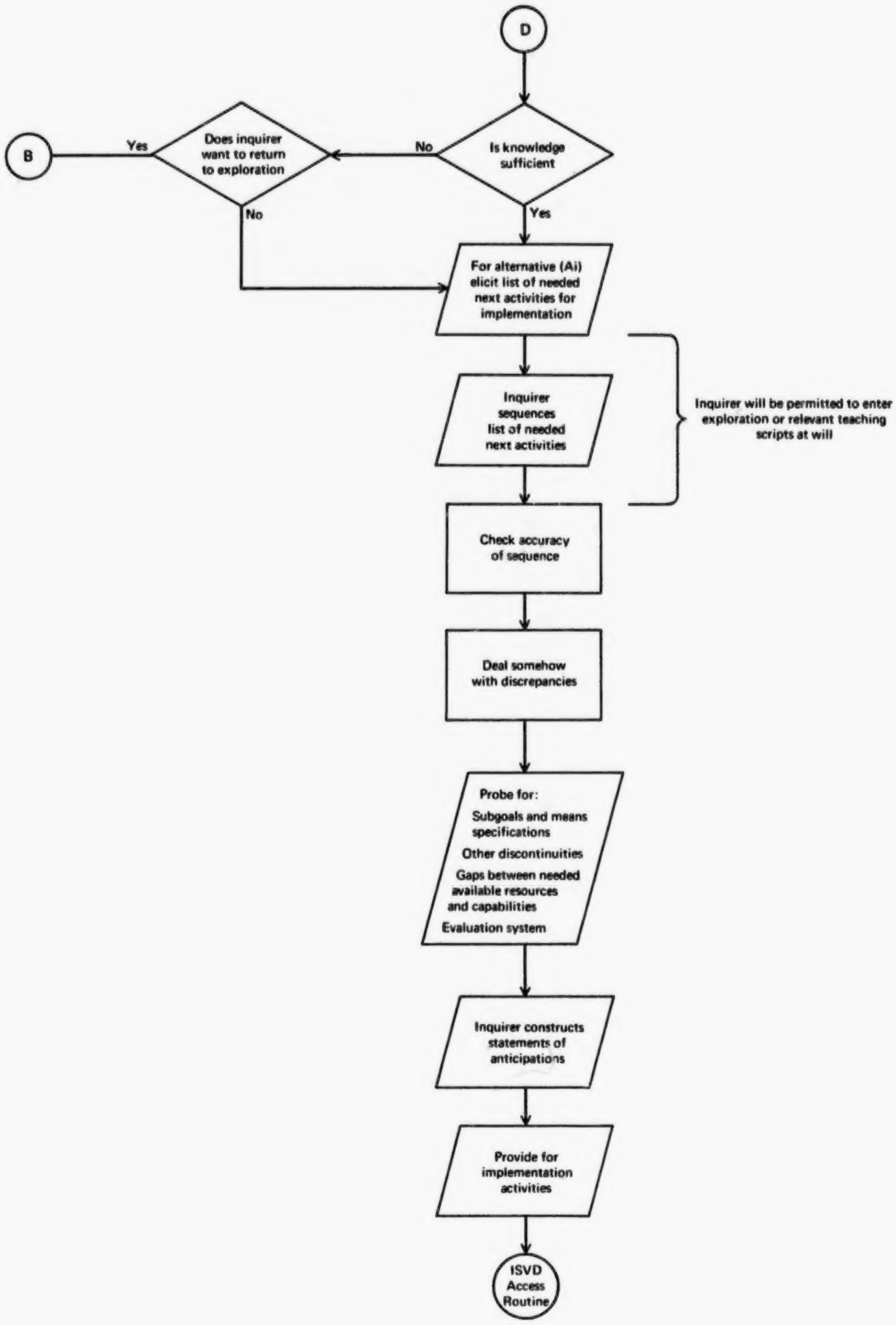
Exploration Access Routine (2)


A
Identify discontinuity inquirer wants to deal with
Has discontinuity been explored
Yes
No
B
Has discontinuity been explored on machine
Yes
Present summary of exploration activities related to this discontinuity
No
Determine what inquirer's exploration activities were in relation to this discontinuity
Present list of excluded alternatives
Does inquirer want to change list of excluded alternatives
Yes
Allow inquirer to alter list of excluded alternatives
No
Get list of criteria for exclusion of alternatives
Discuss bases for exclusion of alternatives to encourage reconsideration
Does inquirer wish to return to exploration
Yes
B
No
C

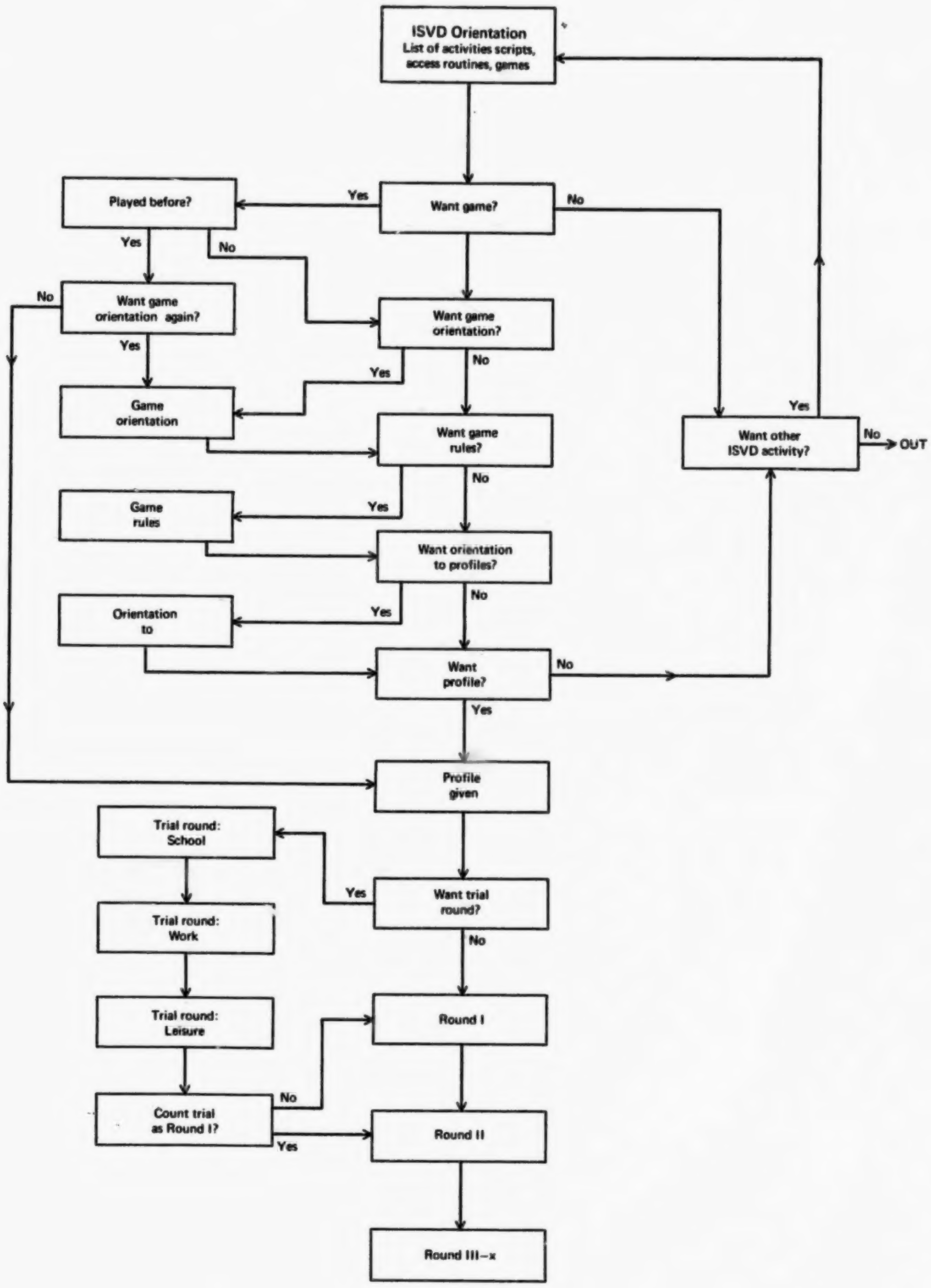
Clarification Access Routine (1)


C
Present list of inquirer's preferred alternatives
Inquirer ranks list
Consider use of Kelly Role Repertory Test here
Compare this ranking with one from exploration. Are they same
No
Yes
Discuss discrepancies with inquirer
Does inquirer wish to return to exploration
No
Yes
B
Get list of criteria for ranking alternatives
Test depth of knowledge of each alternative
Consider
1. Role Rep Test
2. O'Hara Test
3. Gribbons RVP
Is knowledge adequate
No
Yes
Does inquirer wish to return to exploration
Yes
No
B
For alternative (Ai) probe for knowledge of consequences in relation to structure
D

Clarification Access Routine (2)

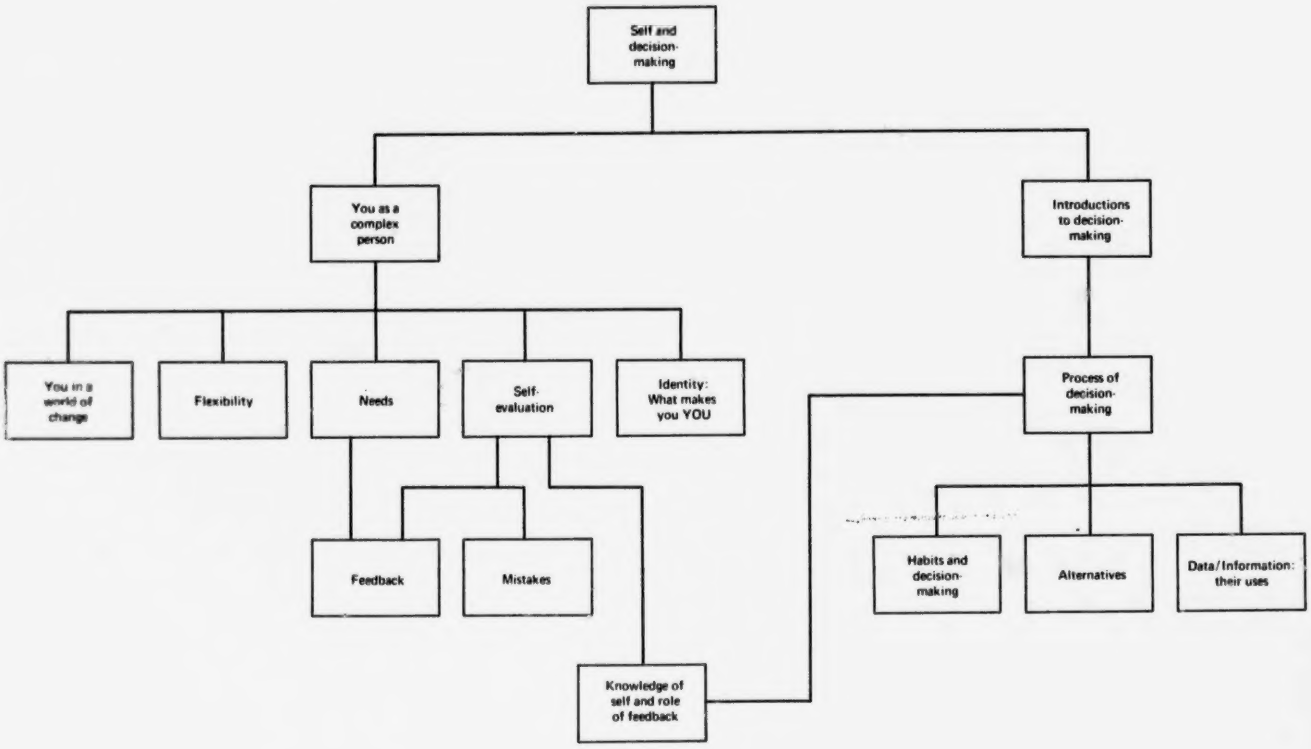

D
Is knowledge sufficient
No
Does inquirer want to return to exploration
Yes
B
No
Yes
For alternative (Ai) elicit list of needed next activities for implementation
Inquirer sequences list of needed next activities
Inquirer will be permitted to enter exploration or relevant teaching scripts at will
Check accuracy of sequence
Deal somehow with discrepancies
Probe for:
Subgoals and means specifications
Other discontinuities
Gaps between needed available resources and capabilities
Evaluation system
Inquirer constructs statements of anticipations
Provide for implementation activities
ISVD Access Routine

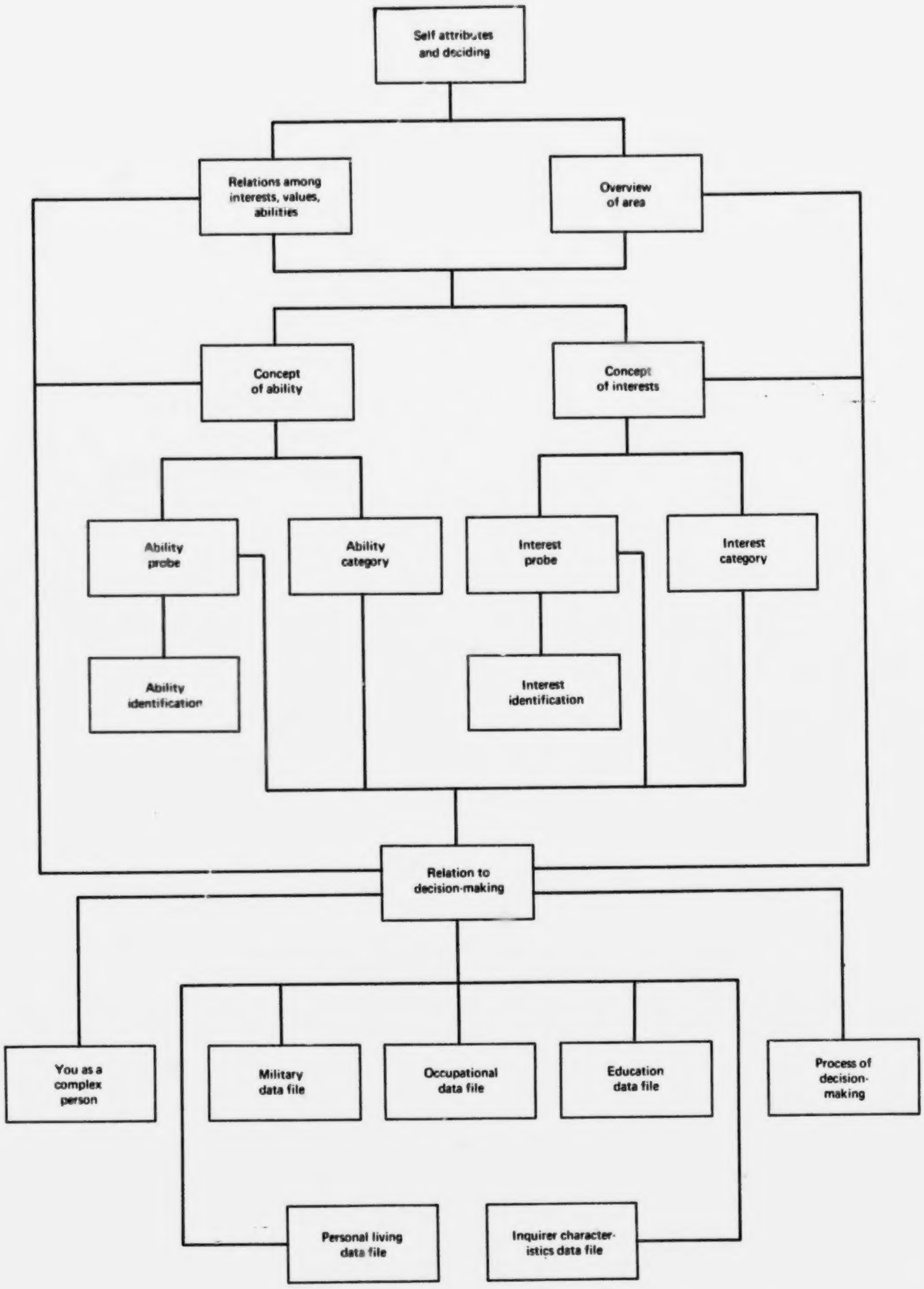
Clarification Access Routine (3)


ISVD Orientation
List of activities scripts, access routines, games
Played before?
Yes
Want game?
No
Yes
No
No
Want game orientation again?
Want game orientation?
Yes
Yes
No
Game orientation
Want game rules?
Yes
Want other ISVD activity?
No
OUT
No
Game rules
Yes
Want orientation to profiles?
No
Orientation to
Yes
Want profile?
No
Yes
Profile given
Trial round: School
Yes
Want trial round?
Trial round: Work
No
Trial round: Leisure
Round I
Count trial as Round I?
No
Yes
Round II
Round III–x

I.S.V.D. Career Game

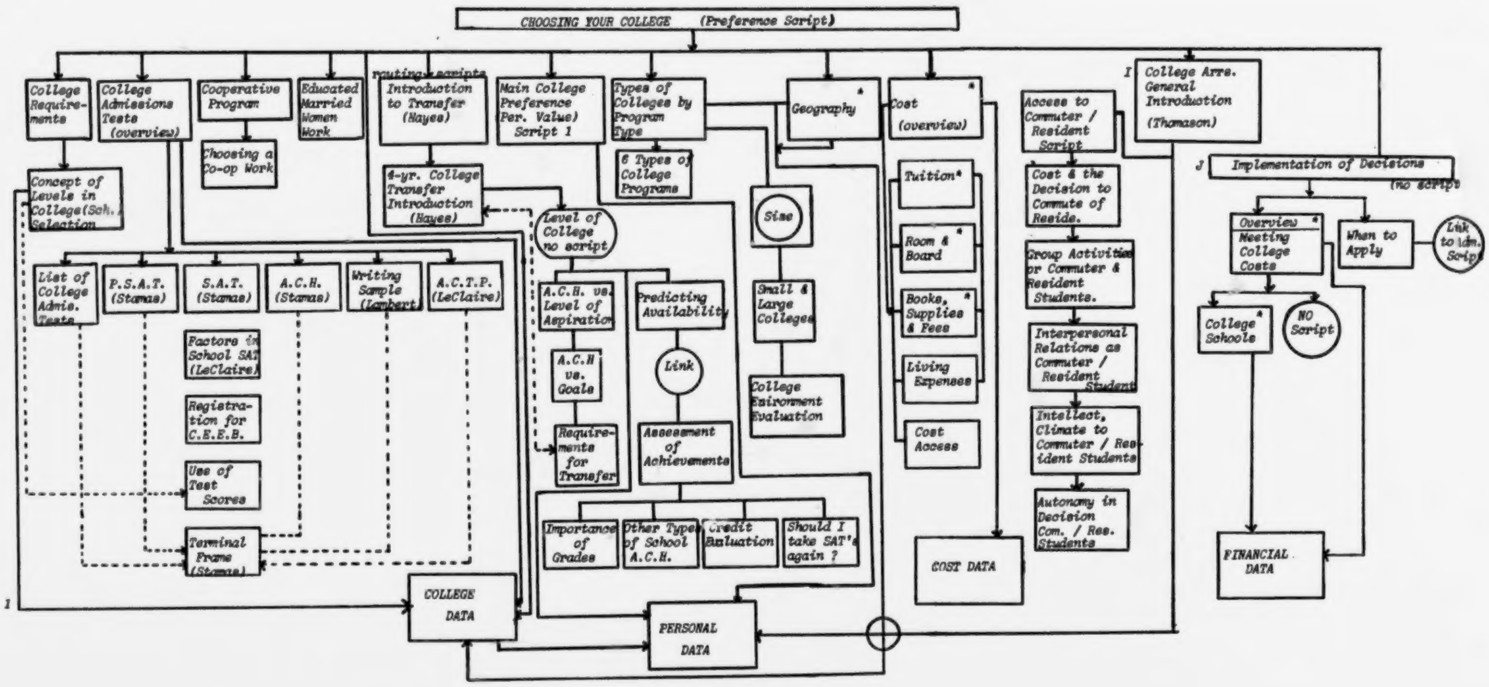
Self and Decision Making


Self and decision-making
You as a complex person
Introductions to decision-making
You in a world of change
Flexibility
Needs
Self-evaluation
Identity: What makes you YOU
Process of decision-making
Feedback
Mistakes
Habits and decision-making
Alternatives
Data/Information: their uses
Knowledge of self and role of feedback

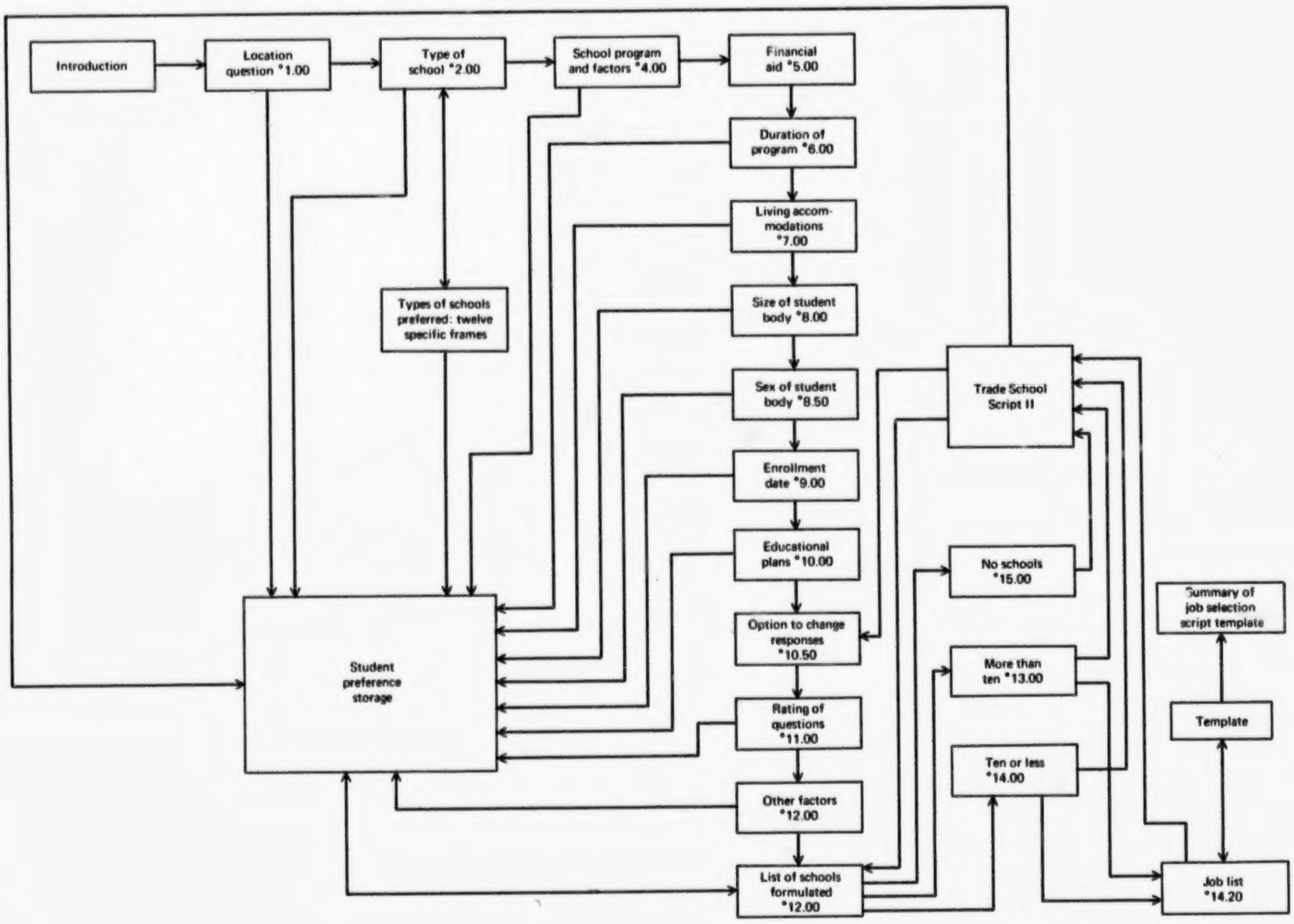

Self attributes and deciding
Relations among interests, values, abilities
Overview of area
Concept of ability
Concept of interests
Ability probe
Ability category
Interest probe
Interest category
Ability identification
Interest identification
Relation to decision-making
You as a complex person
Military data file
Occupational data file
Education data file
Process of decision-making
Personal living data file
Inquirer characteristics data file

Self Attributes and Deciding

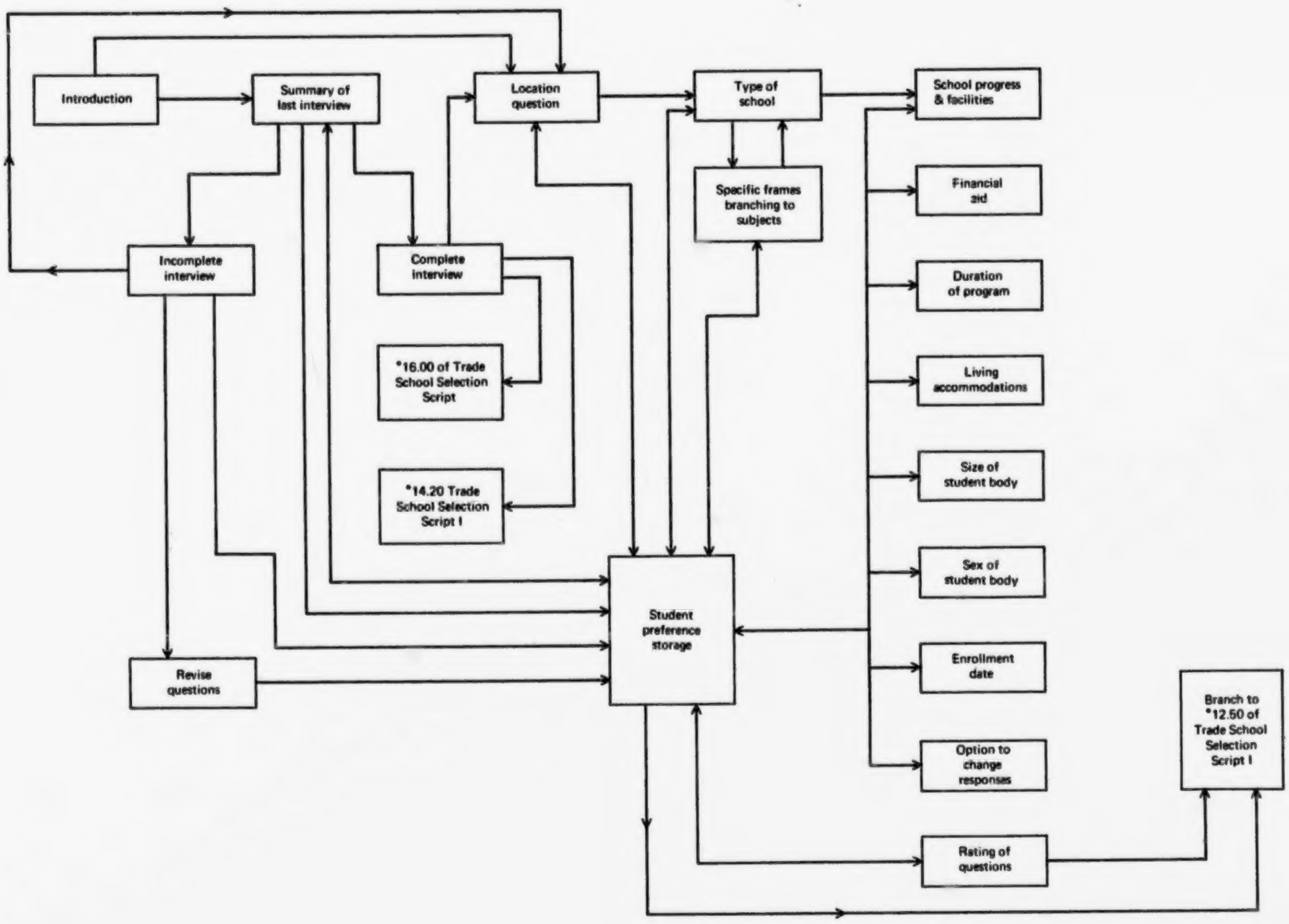
College Preference Script


CHOOSING YOUR COLLEGE (Preference Script)
College Requirements
College Admissions Tests (overview)
Cooperative Program
Educated Married Women Work
routing scripts
Introduction to Transfer (Hayes)
Main College Preference (Per. Value) Script 1
Types of Colleges by Program Type
Geography *
Cost (overview) *
Access to Commuter / Resident Script
I
College Arrs. General Introduction (Thomason)
Choosing a Co-op Work
Concept of Levels in College (Sch.) Selection
4-yr. College Transfer Introduction (Hayes)
6 Types of College Programs
Level of College no script
Size
Tuition*
Room & Board *
Books, Supplies & Fees *
Living Expenses
Cost Access
Cost & the Decision to Commute of Reside.
Group Activities or Commuter & Resident Students.
Interpersonal Relations as Commuter / Resident Student
Intellect, Climate to Commuter / Resident Students
Autonomy in Decision Com. / Res. Students
J
Implementation of Decisions (no script)
Overview * Meeting College Costs
When to Apply
Link to Adm. Script
College Schools *
NO Script
List of College Admis. Tests
P.S.A.T. (Stamas)
S.A.T. (Stamas)
A.C.H. (Stamas)
Writing Sample (Lambert)
A.C.T.P. (LeClaire)
Factors in School SAT (LeClaire)
Registration for C.E.E.B.
Use of Test Scores
Terminal Frame (Stamas)
A.C.H. vs. Level of Aspiration
Predicting Availability
A.C.H vs. Goals
Link
Requirements for Transfer
Assessment of Achievements
Small & Large Colleges
College Environment Evaluation
Importance of Grades
Other Types of School A.C.H.
Credit Evaluation
Should I take SAT's again ?
1
COLLEGE DATA
PERSONAL DATA
COST DATA
FINANCIAL DATA

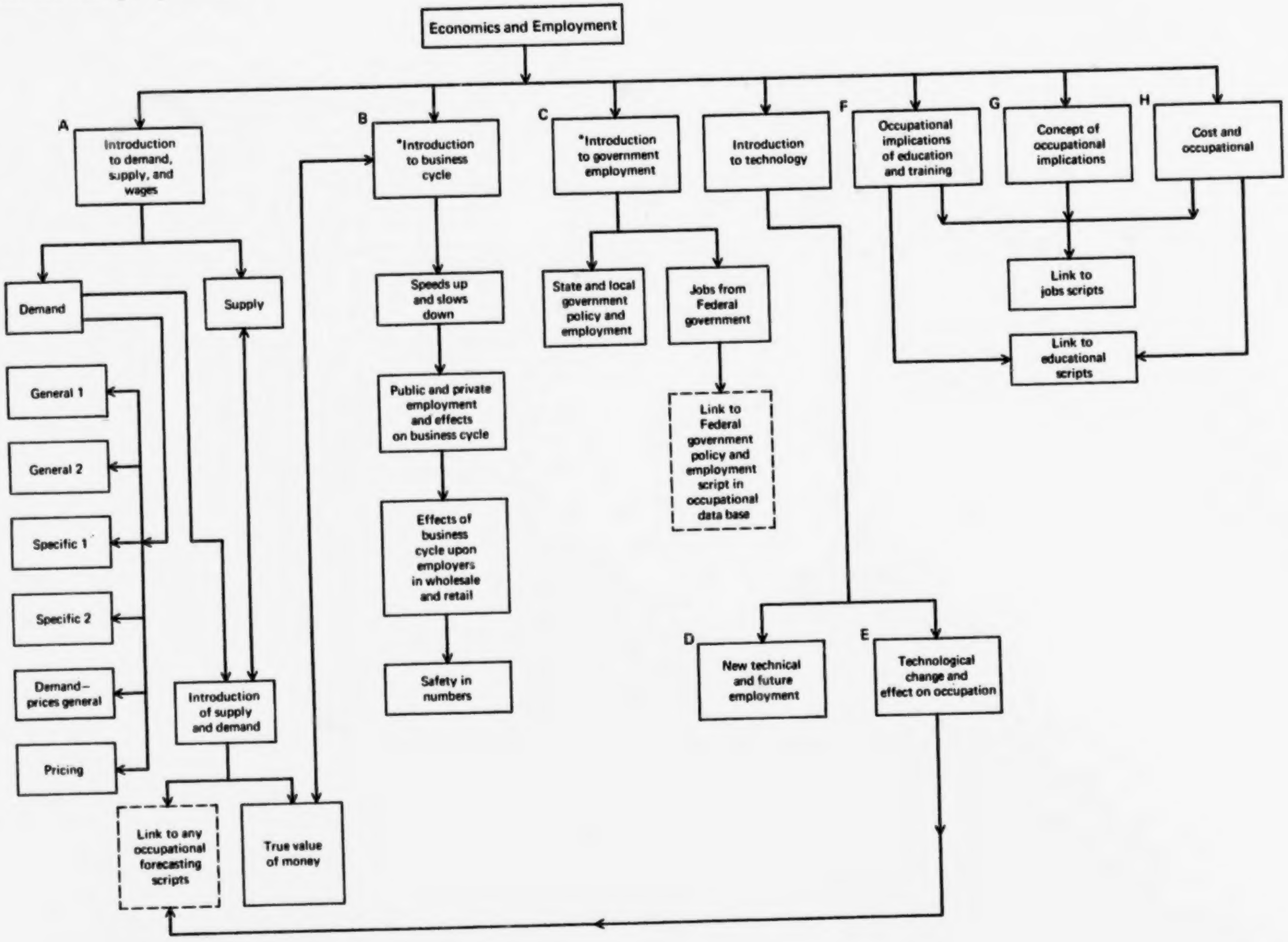
Trade School Selection Script I


Introduction
Location question *1.00
Type of school *2.00
School program and factors *4.00
Financial aid *5.00
Duration of program *6.00
Living accommodations *7.00
Size of student body *8.00
Types of schools preferred: twelve specific frames
Sex of student body *8.50
Trade School Script II
Enrollment date *9.00
Educational plans *10.00
No schools *15.00
Summary of job selection script template
Student preference storage
Option to change responses *10.50
More than ten *13.00
Rating of questions *11.00
Template
Ten or less *14.00
Other factors *12.00
List of schools formulated *12.00
Job list *14.20

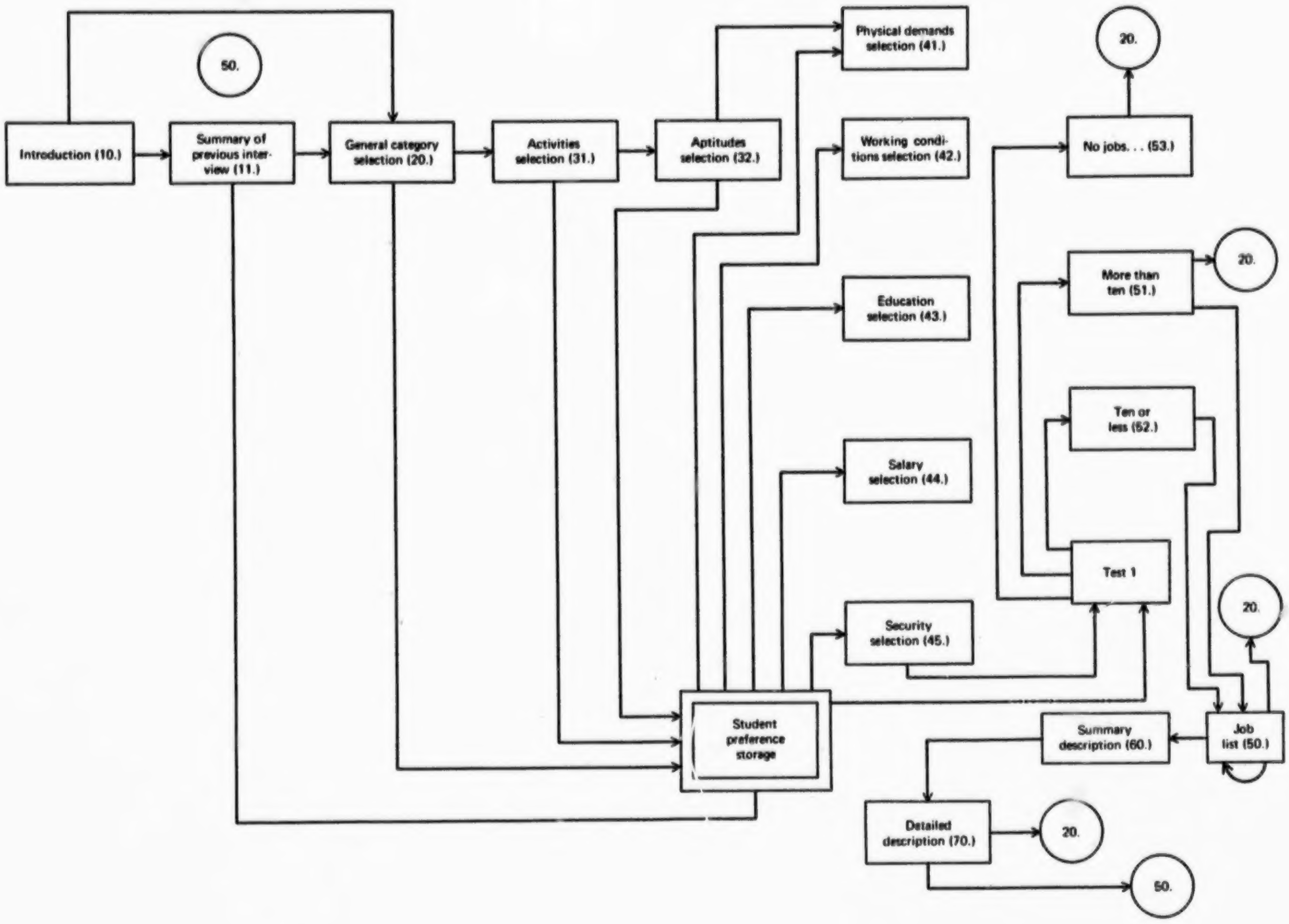
Trade School Selection Script II

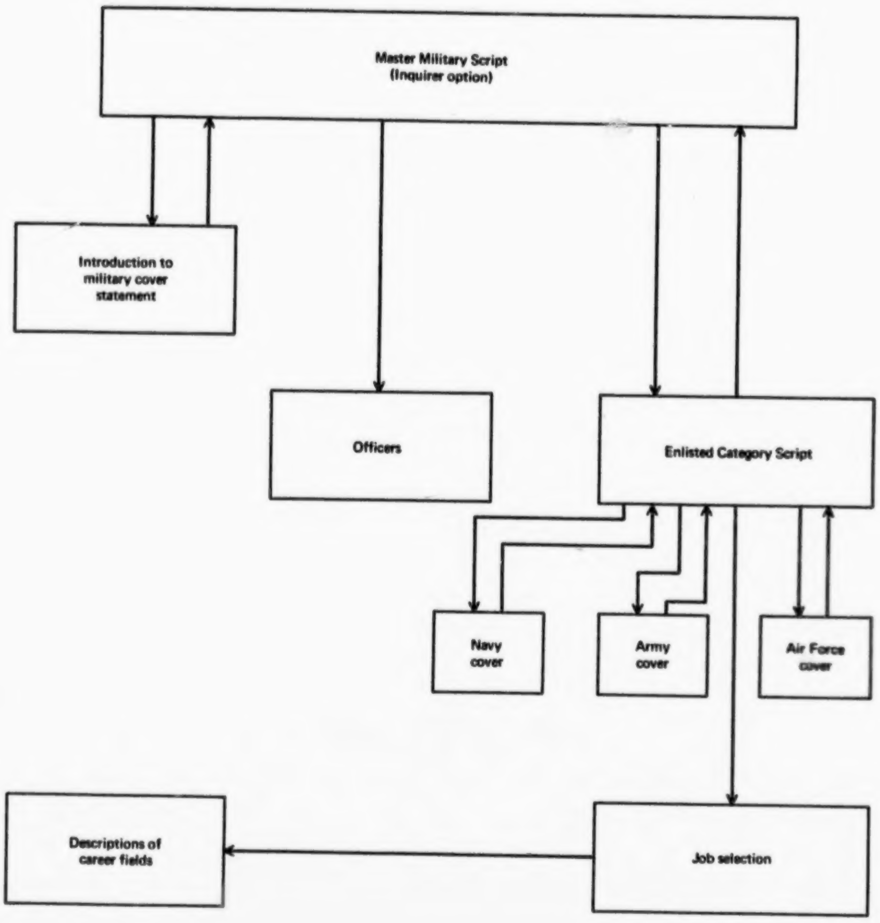

Introduction
Summary of last interview
Location question
Type of school
School progress & facilities
Specific frames branching to subjects
Financial aid
Incomplete interview
Complete interview
Duration of program
*16.00 of Trade School Selection Script
Living accommodations
*14.20 Trade School Selection Script I
Size of student body
Sex of student body
Student preference storage
Enrollment date
Revise questions
Branch to *12.50 of Trade School Selection Script I
Option to change responses
Rating of questions

Economics of Employment


Economics and Employment
A
Introduction to demand, supply, and wages
B
*Introduction to business cycle
C
*Introduction to government employment
Introduction to technology
F
Occupational implications of education and training
G
Concept of occupational implications
H
Cost and occupational
Demand
Supply
General 1
General 2
Specific 1
Specific 2
Demand–prices general
Pricing
Introduction of supply and demand
Link to any occupational forecasting scripts
True value of money
Speeds up and slows down
Public and private employment and effects on business cycle
Effects of business cycle upon employers in wholesale and retail
Safety in numbers
State and local government policy and employment
Jobs from Federal government
Link to Federal government policy and employment script in occupational data base
D
New technical and future employment
E
Technological change and effect on occupation
Link to jobs scripts
Link to educational scripts

Job Preference Interview

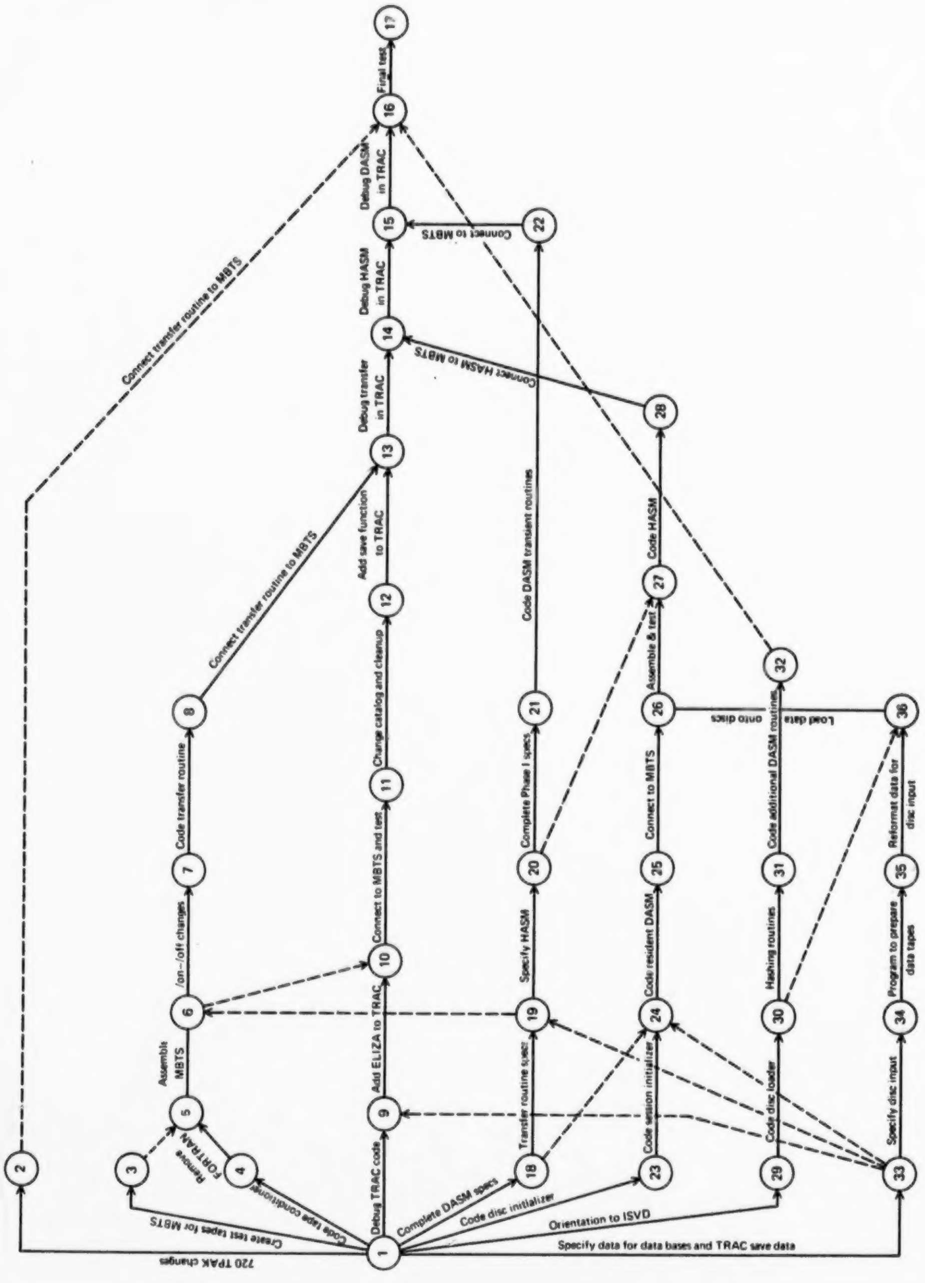

Introduction (10.)
50.
Summary of previous interview (11.)
General category selection (20.)
Activities selection (31.)
Aptitudes selection (32.)
Physical demands selection (41.)
Working conditions selection (42.)
Education selection (43.)
Salary selection (44.)
Security selection (45.)
Student preference storage
20.
No jobs. . . (53.)
More than ten (51.)
20.
Ten or less (52.)
Test 1
20.
Job list (50.)
Summary description (60.)
Detailed description (70.)
20.
50.


Master Military Script
(Inquirer option)
Introduction to military cover statement
Officers
Enlisted Category Script
Navy cover
Army cover
Air Force cover
Descriptions of career fields
Job selection

Master Military Script

APPENDIX IV

PERT Chart: Systems Software


1
2
3
4
5
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7
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9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
720 TPAK changes
Create test tapes for MBTS
Code tape conditioner
Remove FORTRAN
Assemble MBTS
/on–/off changes
Code transfer routine
Connect transfer routine to MBTS
Connect transfer routine to MBTS
Debug TRAC code
Add ELIZA to TRAC
Connect to MBTS and test
Change catalog and cleanup
Add save function to TRAC
Debug transfer in TRAC
Debug HASM in TRAC
Debug DASM in TRAC
Final test
Complete DASM specs
Transfer routine specs
Specify HASM
Complete Phase I specs
Code DASM transient routines
Connect to MBTS
Code disc initializer
Code session initializer
Code resident DASM
Connect to MBTS
Assemble & test
Code HASM
Connect HASM to MBTS
Orientation to ISVD
Code disc loader
Hashing routines
Code additional DASM routines
Load data onto discs
Specify data for data bases and TRAC save data
Specify disc input
Program to prepare data tapes
Reformat data for disc input

APPENDIX V

Specifications for an Orientation-Guidance-Placement Suite in a New Technical Vocational Facility for the City of Boston

1. *Description of Action in the Space*

   This space will be used for counseling sessions with individual students. In addition, it will provide a place where students can consult a career library. Placement interviews will occur in specially provided conference rooms.

2. *General Description of the Space*

   The counseling area should have an attractive waiting space. In addition, space will be necessary for 20 counselors' offices and 10 secretaries. The placement area should provide offices and at least one conference room which could be converted to an interview suite. A career library should be provided adjacent to the waiting area. Considerable secure storage space will be necessary for tests and student records. At least one area for testing students should be provided in this area.

3. *Location in Building*

   This area should be located near the library and adjacent to the main patterns of student traffic flow to provide centrality and to encourage additional use.

4. *Furniture and Equipment*

   The equipment in this area will include desks, chairs, tables, conference room furniture, work counters, file and records cabinets. Carrels providing for the use of electronic media should be available for counseling students.

5. *Storage*

   Adequate storage for permanent and daily records will be required. A fireproof vault is highly recommended to accommodate records and data assembled in this area.

6. *Media Requirements*

   Media requirements will be of three types: (1) a direct link to the computer in the Media Center, where the computer storage for occupational information will be based, and to the central media facility in the same location. Regarding the latter, provision should be made for several types of on-line visual displays such as films, video tape, and electronic blackboards. In addition, the O-G-P Suite will have its own supply of film loops, transparencies, and related projectors. These will be used and stored, to a significant extent, in common with the Experiential Laboratory, which will be using much of the same materials; (2) a similar link must be provided for access to computer-stored administrative data, such as attendance information, personal history, and so forth; and (3) a closed-circuit TV link with each of the four program areas so that orientation programs may include observation of actual shop operations.

7. *Utility Requirements*

   This area should be well lighted and have multi-zone controls for heating, ventilating, and air conditioning. Provision must be made for floor and wall outlets, for telephones, machines, and electronic equipment.

8. *Additional Information*

   This suite will be the locale for providing personal guidance to all students, for providing them with up-to-date occupational information, and for placing them in jobs subsequent to program completion. The staff will be composed not only of generalists, but of specialists in each of these areas, as well as in tests and measurements. In cooperation with the staff of the Experiential Laboratory, the staff will be closely involved in providing orientation programs to both school-age and adult students. Space will also be provided for guidance-liaison personnel from the home high schools, who will be working both in and out of the Occupational Resources Center (ORC) proper.

   Besides the usual offices, individual conference rooms, and small-group conference rooms, a special section of the suite will be set aside for the occupational information and placement function. This area will include its own individual conference rooms, an occupational information library and file area (patterned after the Newton model), and a number of computer remote consoles which will provide the student terminals for the type of system now under development in the Harvard-Newton-NEEDS-ISVD Project. It should be clearly understood that this specialized section of the suite is integral with the rest of the guidance operation. Staff members who are primarily performing placement services will also be qualified guidance counselors and will work interchangeably with counselors performing nonplacement functions.

The O-G-P staff first will cooperate with the Experiential Laboratory staff in providing orientation activities both for junior high and 10th and 11th grade home high school students who need the following: first, familiarity with the manner in which instruction is offered in the center, not only the scope of the offerings. Their initial contact with a machine system—at least at the ORC—will come in the O-G-P Suite. Second, in the process of learning this, learners will also familiarize themselves with the scope and use of occupational information (both computerized and other) as an aid in developing their own decision-making capabilities. Third, they will undergo various kinds of attitude and ability tests which will later be used to help them reach realistic decisions regarding early career preparation. Finally, they will learn, before they matriculate in ORC programs, what personal guidance services will be available to them and under what general conditions. In the same manner, adults will likewise be introduced into the ORC, but within a more intensive kind of program. After the student begins actual work at the ORC, he will continue the personal and occupational guidance segments of this program, under the direction of teams composed of O-G-P staff, home, school or public agency staff, and members of the program area to which he is basically attached.

The O-G-P Suite must be physically adjacent, or nearly so, to the Experiential Laboratory, the Remedial Center, and the Offices for Related Organizations. Some guidance will occur in specially structured situations in the Experiential Laboratory, and these two staffs must be able to move easily from one area to the other. Similarly, the need for remedial work, particularly literacy training, must be continually monitored through the testing activities which are provided in the O-G-P Suite. Finally, since representatives in the "Outside Agencies Suite" will be largely concerned with job opportunities and development, every effort must be made to provide them with immediate access to the staff of the O-G-P.